Validation report form for renewal of crediting period for CDM project activities

(Version 02.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title and UNFCCC reference number of the project activity	Proactiva Tijuquinhas Landfill Gas Capture and Flaring project (UNFCCC ref. no. 1506)
Number and duration of the next crediting period	2nd 7-year crediting period (from 29/10/2015 to 28/10/2022)
Version number of the validation report for RCP	02.0
Completion date of the validation report for RCP	15/05/2018
Version number of PDD to which this report applies	7.0
Project participants	Proactiva Meio Ambiente – Brasil Proactiva Medio Ambiente S.A. Veolia Propreté
Host Party	Brazil
Applied methodologies and standardized baselines	ACM0001 – "Flaring or use of landfill gas" (version 18.0)
Mandatory sectoral scopes linked to the applied methodologies	13 - Waste handling and disposal
Conditional sectoral scopes linked to the applied methodologies	N/A
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	168,391 tCO_2e per year
Name and UNFCCC reference number of the DOE	E-0062 - EPIC Sustainability Services Pvt. Ltd. (EPIC) Report: ESSPL/CDM/2018/186
Name, position and signature of the approver of the validation report for RCP	Mr. Marco Ratton (Lead Auditor)  Mr. K Sudheendra (Head - Operations) 

SECTION A. Executive summary

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EPIC Sustainability Services Pvt. Ltd. (hereafter referred to as EPIC) was commissioned by Proactiva Meio Ambiente – Brasil (hereinafter referred to as PP) to perform the validation assessment of the renewal of 7-year crediting period for the registered CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project" (hereinafter referred to as the project activity). The project activity is located in Brazil and it was previously registered under the CDM by the UNFCCC on 13/08/2008 (UNFCCC reg. no: 1506) under a renewable crediting period of 7 years. The 1st 7-year crediting period of the project activity encompassed the period from 29/10/2008 to 28/10/2015.

The host-country project participant and project owner Proactiva Meio Ambiente – Brasil, successfully notified the Secretariat of the CDM Executive Board (CDM-EB) on 07/03/2018 of their intention to request renewal of the 7-year crediting period of the project activity by submitting a draft version of the updated PDD (version 5.0, dated 13/01/2018) and informing of the selection of EPIC as the validating DOE.

Project design:
The design of the project activity encompasses collection and destruction (through combustion in high temperature enclosed flares under efficient and controlled conditions) of landfill gas (LFG) at the Tijuquinhas landfill. The project design currently does not encompass any utilization of collected LFG as fuel for electricity generation, heat generation or any other means of utilization. The project activity thus promotes destruction of methane (CH_4) that would otherwise be directly emitted into the atmosphere in the absence of the project activity (baseline scenario).
LFG (which is rich in CH_4) has been historically generated at the Tijuquinhas landfill as a result of anaerobic decomposition of municipal solid waste (MSW) historically disposed in such landfill through the utilization of appropriate MSW landfilling techniques and procedures.
As per the project design, the electricity demand of the project activity is met through imports of electricity sourced from the National Electricity Grid of Brazil and/or by electricity sourced by an available backup captive off-grid electricity generator fuelled by diesel and installed as part of the project activity. Such backup electricity generator is to be used whenever supply of grid electricity to the project activity is temporarily interrupted.

The Tijuquinhas landfill is located in the Municipality of Biguaçu. Biguaçu is a part of the metropolitan area of Florianópolis, the capital of Santa Catarina State, which is located in the Southern region of Brazil.

This Validation Report summarizes the findings from the validation assessment performed on the basis of UNFCCC criteria for CDM, as well as criteria given by the latest version of the CDM Validation and Verification Standard for Project Activities (CDM-VVS for PA) (version 01.0) /1/, CDM Project Cycle Procedure for Project Activities (CDM-PCP for PA) (version 01.0) /16/ and CDM Project Standard for Project Activities (CDM-PS for PA) (version 01.0) /15/.

Scope and objective of the validation assessment for renewal of crediting period:
The scope of the validation of the renewal of crediting period is to provide an independent and objective validation assessment of the updated Project Design Document (PDD) for the registered project activity (hereinafter referred to as updated PDD) relating to the baseline, estimated emission reductions, design of the monitoring plan and starting date of the 2nd 7-year crediting period. The updated PDD applies the most recent version of the CDM baseline and monitoring methodology + methodological tools which are applicable to the project activity + applicable CDM guidance and rules. The validation opinion provided by EPIC is based on the assessment of the updated PDD /2/ through applying standard auditing techniques including, but not limited to, document reviews, on-site visit to the project site, follow up actions (e.g. telephone or e-mail interviews) and also the review of the applicable CDM baseline and monitoring methodology + applicable methodological tools and underlying formulae and calculations.

The validation assessment was carried out in accordance with the latest version of the CDM VVS for PA /1/ and the latest version of the CDM PS for PA /15/ including an assessment of the following issues:

a) The impact of eventually new relevant national and/or sectoral policies and circumstances that would affect the baseline scenario for the project activity by taking into account relevant guidance from the Board with regard to renewal of its crediting period at the time of requesting renewal of crediting period of the project activity;
b) The correctness of the application of the CDM baseline and monitoring methodology selected for the determination of the continued validity of the baseline (ACM0001 (version 18.0) /5/) + methodological tools applicable to the project activity or its update, and the estimation of emission reductions for the 2nd 7-year crediting period of the registered CDM project activity.
c) The correctness of the designed monitoring plan valid for the 2nd 7-year crediting period (based on the application of ACM0001 (version 18.0) /5/ + methodological tools applicable to the project activity).

The objective of the validation assessment for renewal of crediting period is to have an independent evaluation being performed by a Designated Operational Entity (DOE) of the updated version of the PDD of a registered project activity for a subsequent 7-year crediting period in terms of its compliance with relevant UNFCCC requirements for the renewal of the crediting period (as per the latest guidance from the CDM Executive Board (CDM-EB), as set out in the CDM-PS for PA /15/, CDM-PCP for PA /16/, and other relevant guidance).

The validation assessment aims to confirm whether the previously derived baseline scenario for the registered project activity is still valid or it has been appropriately updated by taking into account new data where applicable. In particular, the project's baseline, monitoring plan and the project's compliance with relevant UNFCCC requirements and host Party criteria are validated in order to confirm the overall correctness of the application of the approved baseline methodology, including estimation of the emission reductions to be achieved by the project activity within its new 7-year crediting period.

In particular, to re-assess the validity of the original baseline or its update through an assessment of the impact of new relevant national and/or sectoral policies and circumstances on the baseline; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update as well as the estimation of emission reductions for the new 7-year crediting period of the project activity.

The validation assessment will result in a conclusion as to whether the a positive validation opinion and request for renewal of crediting period should be submitted to the CDM Executive Board. The final decision on whether to renew the crediting period rests with the CDM-EB.

The validation is not meant to provide any consulting towards the project participants of the registered project activity. However, stated requests for clarifications and/or corrective actions may have provided input for improvement for the completion of the updated version of the PDD.

The validation assessment for renewal of crediting period was carried out on the basis of the following rules and requirements that are applicable for the CDM project activity:

- Article 12 of the Kyoto Protocol /6/,

- Guidelines for the implementation of Article 12 of the Kyoto Protocol /6/ as presented in the Marrakech Accords under decision 3/CMP.1 /7/ and subsequent decisions made by the Executive Board and COP/MOP,

- Other relevant rules, including applicable and valid host country legislation/regulations,

- The CDM Validation and Verification Standard for Project Activities (CDM-VVS for PA) version 01.0 /1/,

- The monitoring plan of the updated PDD /2/ applicable for the 2nd 7-year renewable crediting period

- The CDM baseline and monitoring methodology ACM0001 “Flaring or use of landfill gas” (version 18.0) /5/,

- Updated version of the PDD valid for the 2nd 7-year crediting period /2/,

- The following methodological tools, which are referred in the PDD:

    - “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0) /11/

    - "Tool to calculate the emission factor for an electricity system” (version 06.0) /13/

    - "Project emissions from flaring" (version 02.0.0) /10/

    - "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/

    - “Combined tool to identify the baseline scenario and demonstrate additionality” (version 07.0) /30/

    - “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (version 03.0.1). /31/

    - “Emissions from solid waste disposal sites” (version 08.0). /14/

Validation process:
The validation process is an independent assessment performed by a Designated Operational Entity (DOE) that is based on applicable and valid guidelines described in the latest version of the CDM-VVS for PA /1/. In addition to that, standard auditing techniques have been applied by the validation team appointed by EPIC. As part of the validation assessment, the validation team initially performed a desk review on all validation related documents, followed by an on-site visit to the project site and interviews with representatives of the project participant Proactiva Meio Ambiente – Brasil

The performed validation assessment encompassed (i) comprehensive review of the latest version of the registered PDD valid for the currently expired 1st 7-year crediting period (from 29/05/2008 to 28/05/2015) (PDD version 4.3, dated July/2011) /3/, (ii) review of the updated PDD for the 2nd 7-year renewable crediting period + review of supporting documents; (iii) on-site visit to the project site, (iv) conduction of interviews with representatives of the project participants; (v) resolution of all identified outstanding issues (raised Corrective Action Request (CAR) and Clarification Requests (CL), if applicable) and finally (vi) issuance of the Validation Report.

As part of the validation process, the validation findings and observations from the performed document desk review, on-site visit to the project site, and interviews with representatives of the project participants. For all identified inconsistencies and lack of clarity, related findings (list of outstanding issues) are raised.

The next steps are to close out the findings through direct communication with the project participant(s) and receipt of updated version of the PDD /2/ and/or supporting documents and finally preparing the Validation Report. The draft version of the Validation Report undergoes a technical review by EPIC prior to its submission to the CDM-EB.

Validation assessment conclusion and summary of the validation opinion:
In summary, it is the opinion of EPIC that the registered CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project", as described in the updated version of the PDD (version 7.0, dated 07/05/2018) /2/, sufficiently meets all relevant UNFCCC requirements for the renewal of its 7-year crediting period (including completion requirements for the PDD) and correctly applies the CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ + applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. EPIC thus requests the CDM-EB to renew the 7-year crediting period for the project activity.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader / Technical Expert	EI	Ratton	Marco	EPIC- Central Office	Y	Y	Y	Y
2.	Auditor	IR	Vishnu	Govindarao	EPIC- Central Office	Y	N/A	N/A	Y

Note: IR: Internal Resources, EI: External Individuals, OR: Outsourced Resource.

Demonstration how the validation team appointed by EPIC meets the competence required for the performance of the verification assessment is included in Appendix 2.

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Radhamadhavan	Vijayaraghavan	EPIC - Central office
2.	Approver	IR	Krishnachar	Sudheendra	EPIC -Central office

Note: IR: Internal Resources, EI: External Individuals, OR: Outsourced Resource.

Demonstration how the appointed technical reviewer and the approver appointed by EPIC meets the competence required for the performance of the validation assessment is included in Appendix 2.

SECTION C. Means of validation

C.1. Desk/document review

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A detailed document reviews on the initial PDD /2/, applied CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ and all other associated documentation and references were performed by the validation team appointed by EPIC through application of standard auditing techniques in order to assess the quality of information provided.

The performed document review encompassed the following:

- Comprehensive review of data and information to verify the correctness, credibility and interpretation of presented information;
- Cross checks between information provided in the updated PDD /2/ and information from other sources (not limited to those provided by the project participants)
- Reference to available information relating to other project based initiatives and/or technologies identical or similar to the one adopted by the project activity
  Review and evaluation, based on the applied CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/, of the appropriateness/correctness of formulae, calculation approaches and monitoring approaches as referred in the updated PDD /2/.

The following documents were assessed:

- PDD applicable to the currently expired 1st 7-year crediting period /3/
- Validation Report for the project activity /8/
- Verification Reports and Monitoring Reports for the previously performed periodic verifications within the currently expired 1st 7-year crediting period for the project activity /22/
- Relevant decisions, clarifications and guidance from the CMP and the CDM-EB
- Relevant regional and national and sectoral policies dealing with solid waste and landfill gas (LFG) management

A list of all documents reviewed or referred to in the course of this report is included in Appendix 3.

C.2. On-site inspection

Duration of on-site inspection: 08/02/2018				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	Opening meeting for the performed on-site visit. During such initial meeting the EPIC validation team was introduced, it was confirmed/outlined the objectives and scope of the on-site visit and it was confirmed the previously planned agenda for such visit. The representatives of the project participants Proactiva Meio Ambiente – Brasil also introduced themselves and completed/signed the EPIC list of participants form for the on-site visit.	Operation control room of the project activity	08/02/2018	Marco A. Ratton
2.	Visual inspection of the waste disposal area of the Tijuquinhas landfill in order to inter alia confirm that no changes of landfill disposal and management practices/techniques have occurred (when compared to the original landfill design) in order to increase methane generation;	Waste disposal areas of the landfill	08/02/2018	Marco A. Ratton
3.	Visual inspection of the infrastructure encompassed by the project activity in order to confirm whether the general descriptions of the project design, applied technology and project location details as added in the updated PDD are under conformance with all infrastructure installed and/or in place as part of the project activity (LFG collection wells and pipeline network, LFG flaring infrastructure, monitoring instruments/equipment, etc.)	Areas within the landfill covered by the project's LFG collection infrastructure + area where the project's LFG destruction infrastructure is installed + operation control room of the project activity	08/02/2018	Marco A. Ratton
4.	Visual inspection of the infrastructure encompassed by the project activity in order to confirm whether the identified project boundary and the schematic flow diagram (delineating the project activity (equipment, parameters to be monitored, and GHG included in the project boundary)) as added in the updated PDD is under conformance with all infrastructure installed and/or in place as part of the project activity (LFG collection wells and pipeline network, LFG flaring infrastructure, monitoring instruments/equipment, etc.)	Areas within the landfill covered by the project's LFG collection infrastructure + area where the project's LFG destruction infrastructure is installed + operation control room of the project activity	08/02/2018	Marco A. Ratton
5.	Visual inspection of the project's data collection and recording infrastructure encompassed by the project activity in order to confirm whether electronically recording for continuously measured LFG related parameters as well as measurements related to the exhaust gas of the flares (temperature in the exhaust gas of the flares and other parameters	Operation control room of the project activity	08/02/2018	Marco A. Ratton

	related to flare operational conditions) via appropriate data logger / data acquisition system (located within the site boundary) + all other required additional monitoring as part of the implementation and application of the monitoring plan for the project activity.			
6.	Visual inspection and review on available documented working instructions in order to confirm the existence of procedures for data recording and archiving as part of the application of the monitoring plan for the project activity.	Operation control room of the project activity	08/02/2018	Marco A. Ratton
7.	Visual inspection and review on available documented working instructions in order to confirm the existence of procedures for maintenance, testing and calibration of monitoring instruments/equipment as part of the implementation and application of the monitoring plan for the project activity.	Operation control room of the project activity	08/02/2018	Marco A. Ratton
8.	Visual inspection and review on available documented working instructions in order to confirm the existence of an operational and management structure relying on trained staff (incl. contractors) with responsibilities clearly defined as part of the implementation and application of the monitoring plan for the project activity.	Operation control room of the project activity	08/02/2018	Marco A. Ratton

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Barbosa	Nuno	Unicarbo Energia e Biogás Ltda[1].	08/08/2017	Implementation and operational status of the project activity + confirmation of non-existence of occurred post-registration changes valid for the project activity in the particular context of its renewal of the 7-year crediting period.	Marco A. Ratton
2.	Freitas	Fernando	Proactiva Meio Ambiente – Brasil	08/02/2018		
3.	Rebilllard	Vincent	Proactiva Meio Ambiente – Brasil	08/02/2018	Meeting of applicability conditions of the selected CDM baseline and monitoring methodology + applicable	

[1] As informed to the EPIC validation team, UniCarbo Energia e Biogás Ltda. is a CDM consulting and advisory service company that has supported the host-country project participant Proactiva Meio Ambiente – Brasil with CDM related issues (inter alia completion of the updated PDD [/2/]). This CDM consulting and advisory service company is not a project participant.

					methodological tools. Applicable national policies and regulations and their eventual impacts in terms of changing of the previously derived baseline scenario and baseline emissions. Application of updated and/or new values for previously existent or new ex-ante determined (fixed) parameters. Design of the monitoring plan valid for the 2nd 7-year crediting period of the project activity (as per applicable requirements of the selected CDM baseline and monitoring methodology + applicable methodological tools).	

C.4. Sampling approach

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N/A

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	N/A	CAR 3	N/A
Application and selection of methodologies and standardized baselines	N/A	CAR 1 CAR 2	N/A
Validity of original baseline or its update	N/A	CAR 4	N/A
Estimated emission reductions or net anthropogenic removals	CL 1	CAR 5, CAR 6	N/A
Validity of monitoring plan	N/A	N/A	N/A
Crediting period	N/A	N/A	N/A
Project participants	N/A	N/A	N/A
Post-registration changes	N/A	N/A	N/A
Others (please specify)	N/A	N/A	N/A
Total	N/A	6	N/A

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	As per the paragraphs 406 and 415 (a), items (i) and (ii) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by EPIC checked if the project participants applied the latest valid version of the PDD form for completing the updated PDD /2/. The EPIC validation team also determined whether project design information transferred to such latest version of the PDD form is materially the same as that included in the latest version of the PDD applicable for the 1st 7-year crediting period and whether such project design description included in the update PDD is deemed complete. The EPIC validation team also determined whether the project participants completed the updated the PDD /2/ by correctly updating the applicability section as per the latest version of the applied CDM methodology in accordance with requirements established by the CDM-PS for PA /15/.
Findings	One Corrective Action Request (CAR) was raised by the EPIC validation team regarding the completion of project design information made available in the updated PDD: CAR 3: The updated PDD does not include sufficient details about the main characteristics and specifications of the installed backup captive off-grid electricity generator (fuelled by diesel).
Conclusion	As a conclusion of its assessment, upon successfully closure of the raised CAR, the EPIC validation team was able to confirm meeting of the following requirements: - The project participants used the latest valid version of the PDD form for completing the updated PDD /2/; - Project design information transferred to the updated PDD /2/ is materially the same as that included in the PDD /3/ applicable for the 1st 7-year crediting period; - Project design description included in the update PDD /2/ is deemed complete; - Selection and application of CDM baseline and monitoring methodology /5/ as well as selection and application of methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ is correctly made; - The methodology applicability section in the updated PDD /2/ is confirmed to be correctly updated as per the latest version of the applied CDM methodology and in accordance with requirements established by the CDM-PS for PA /15/.

	The updated PDD /2/ was completed by correctly applying the latest version of the CDM-PDD form (version 10.1) and with all applicable guidance for its completion being sufficiently and appropriately followed. Applicable guidance and requirements for completing the CDM-PDD form (version 10.1) as established by the attachment to the CDM-PDD form (version 10.1) termed as "*Attachment Instructions for completing this form*" /17/ were confirmed by the EPIC validation team to be correctly considered. Relevant rules and requirements as per the CDM-PS for PA /15/ were also confirmed to be sufficiently met/considered in the completion of the updated PDD /2/. While the PDD /3/ valid for the 1st 7-year crediting period of the project activity applies the CDM baseline and monitoring methodology ACM0001 - Consolidated methodology for landfill gas project activities (version 5) + applicable methodological tools; the updated PDD /2/ applies the latest version of such methodology (version 18.0) /5/ + applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. The EPIC validation team was able to confirm that some sections of the updated PDD /2/ were appropriately and correctly completed through transferring of significant amount of project design description information elements from the latest version of the PDD applicable for first crediting period /3/. While as per paragraph 271 of the CDM-PCP for PA (version. 01.0) /16/, it is not required to obtain a new letter of approval (LoA) from involved Parties in the context of the renewal of crediting period for a CDM project activity, the EPIC validation team confirmed anyway that indication of the host-country and names of the project participants are correctly included in the updated PDD /2/. In summary, the EPIC validation team is able to confirm that information made available in the updated PDD/2/ is sufficiently accurate, complete, and it provides clear understanding of the CDM project activity.

D.2. Application and selection of methodologies and standardized baselines

Means of validation	As per paragraph 403 of the CDM-VVS for PA version 1.0 /1/, the validation team appointed by EPIC checked whether the project participants had used the valid and latest version of the CDM baseline and monitoring methodology /5/ that was previously applied in the PDD valid for the currently expired 1st 7-year crediting period and had sufficiently demonstrated the project design is in line with the applicability conditions for such selected methodology. The EPIC validation team has also checked whether correct selection and application of methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ were made.
Findings	Two Corrective Action Requests (CARs) were raised by the EPIC validation team regarding the application and selection of CDM baseline methodology and/or methodological tools: CAR 1: The applied versions of the methodological tools "Tool to calculate the emission factor for an electricity system" and "Combined tool to identify the baseline scenario and demonstrate additionality" do not correspond to the latest versions of such tools. CAR 2: The indication of GHG emissions included under the project scenario is not under conformance with ACM0001 (version 18.0).
Conclusion	As a conclusion of its assessment, upon successfully closure of the raised CARs, the EPIC validation team confirmed that selection and application of CDM baseline and monitoring methodology as well as selection and application of methodological

tools were correctly made.

The registered version of the PDD valid for the currently expired first 7-year crediting period /2/ applies the CDM baseline and monitoring methodology ACM0001 - Consolidated methodology for landfill gas project activities (version 5) /27/. However, for the completion of the updated PDD /2/, the baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas" (version 18.0) /5/ was selected. The EPIC validation team was able to confirm that version 18.0 represents the latest version of ACM0001.
Thus, the selection of ACM0001 (version 18.0) /5/ for completing the updated PDD /2/ is confirmed as being correct.

As also confirmed by the EPIC validation team, the following methodological tools were correctly selected and applied in the updated version of the PDD:

- "Emissions from solid waste disposal sites" (version 08.0) /14/
- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/
- "Project emissions from flaring" (version 02.0.0) /10/
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/
- "Tool to calculate the emission factor for an electricity system" (version 06.0) /13/
- "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) /30/
- "Assessment of validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.0.1) /32/

The EPIC validation team has also checked the current list of valid standardized baselines as outlined in the applicable section of the UNFCCC CDM website /38/, and confirmed that there is no standardized baseline applicable to the project activity which is hosted in Brazil.

The EPIC validation team confirmed that the selected CDM baseline and monitoring methodology /5/ and all applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ were correctly applied with respect to the following:

- Meeting of applicability conditions/criteria (assessment details included in Appendix 5 of this Validation Report)
- Delineation of project boundary and selection of emission sources and Greenhouse gases (GHGs) (assessment details included below in this Section);
- Baseline identification (assessment details included in Section D.3)
- Algorithms and/or formulae used to determine emission reductions (assessment details included in Appendix 6 of this Validation Report)
- Selection and definition of values for ex-ante determined (fixed) parameters (assessment details included in Appendix 7 of this Validation Report)
- Monitoring plan (including selection and definition of parameters monitored ex-post and monitoring approaches for such parameters (assessment details included in Appendix 8 of this Validation Report)

Assessment of meeting of applicability conditions/criteria for the selected CDM baseline and monitoring methodology + applicable methodological tools:
The updated PDD /2/ has been completed in full conformance with the selected CDM baseline and monitoring methodology /5/ + applicable methodological tools /10/ /10/ /11/ /12/ /13/ /14/ /31/ /32/. As outlined in Section B.2 of the updated PDD /2/ for the 2nd crediting period, all applicability criteria/requirements for this CDM baseline and monitoring methodology and applicable methodological tools are demonstrated to be sufficiently met.
Details for the assessment performed by the EPIC validation team of how such applicability criteria/requirements are met is summarized in Appendix 5 of this Validation Report.

Assessment of the definition of the project boundary as per the PDD:
As established by the applied methodology /5/, the project boundary for the project activity is correctly identified in the updated PDD /2/ as the site where LFG is

captured and destroyed. Since the electricity demand of the project activity is met primarily by imports of grid-sourced electricity from the National Electricity Grid of Brazil, the project participants have correctly included National Electricity Grid of Brazil as the spatial boundary for the project activity.
All GHG emission sources and GHG gases included in the project boundary are correctly outlined in Section B.3 of the updated PDD /2/ as summarized below:

GHG emission sources included in the project boundary:

	GHGs included	Description
Baseline scenario	CO_2	Not included. CO_2 emissions from decomposition of organic waste are not accounted since the CO_2 is also released under the project activity.
	CH_4	Included. Methane in LFG is generated as a result of anaerobic decomposition of the organic fraction of the municipal solid waste (MSW) disposed in the Tijuquinhas landfill since it started to operate.
	N_2O	Excluded for simplification. This emission source is assumed to be very small.
Project scenario	CO_2	Included. Grid-sourced electricity consumption by the project activity (and eventually diesel consumption by the off-grid captive electricity generator)[2].
	CH_4	Included. CH_4 emissions resulted from flaring (residual CH_4 in the exhaust gas of the flare). It is however important to note that as per ACM0001 (version 18.0) /5/, such emissions are to be considered in the context of the calculation/determination of baseline emissions.
	N_2O	Excluded for simplification. This emission source is assumed to be very small.

The selected emission sources and GHGs are correct and are appropriately justified for the project activity.

No leakage emissions are considered as leakage emissions are not required to be accounted as per applied methodology /5/.

In summary, the identified project boundary is confirmed by the EPIC validation team as being under compliance with the selected CDM baseline and monitoring methodology /5/ + applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. The definition of the project boundary is sufficiently justified in the updated PDD /2/.

The EPIC validation team also confirms that there are no GHG emission sources, which are not addressed by the applied methodology, and which are expected to contribute more than 1% of the overall expected annual average emission reductions.

It was also confirmed by the EPIC validation team that all main GHG emission sources, the physical delineation of the CDM project activity, and other relevant project and baseline emission sources covered in the applied methodology are included within the project boundary for the purpose of calculating project and baseline emissions for the project activity. The identified project boundary and the selected sources and gases are correctly justified in the updated PDD /2/.

[2] As correctly outlined in the updated PDD, the captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for emergency purposes (whenever supply of grid electricity to the project activity is temporarily interrupted). However, as per the PDD such project emissions will be determined *ex-post* during the 2nd 7-year renewable crediting period (based on applicable monitoring and calculation requirements according to the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/) and will be accounted for the determination of emission reductions.

D.3. Validity of original baseline or its update

Means of validation	In accordance with paragraph 407 of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by EPIC reviewed the validity of the previously identified baseline scenario for the project activity against the requirements of the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (version 03.0.1) /31/) (hereinafter referred to as baseline validity tool).
Findings	Two Corrective Action Requests (CARs) were raised by the EPIC validation team regarding the demonstration of validity of the previously identified baseline scenario for the project activity against the requirements of the baseline validity tool: CAR 4: In the context of the assessment of the determination of the baseline scenario (in order to demonstrate the continuation of earlier identified baseline scenario), the definition of the of the alternative scenarios to the CDM project activity (as part of the application of Step 1a of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0)) is not under conformance with ACM0001 (version 18.0).
Conclusion	As a conclusion of its assessment, upon successfully closure of the raised CAR, the EPIC validation team confirmed the validity of the previously identified baseline scenario for the project activity against the requirements of the baseline validity tool /32/. Section B.4 of the updated PDD/2/ includes the complete application of the stepwise approach of the baseline validity tool for demonstrating the validity of the previously derived baseline scenario for the project activity. As confirmed by the EPIC validation team, the baseline scenario for the project activity was previously determined and assessed at the time of the validation of the project activity within years 2006 and 2007 as being most of LFG generated at the Tijuquinhas landfill being emitted into the atmosphere (with reduced share of generated LFG being sporadically combusted in a set of pre-project conventional LFG venting/combustion drains. The demonstration of validity of the baseline scenario is performed by presenting in Section B.4 of the updated PDD /2/ the whole determination of the baseline scenario by also following applicable guidance and stepwise procedure of the selected CDM baseline and monitoring methodology. The steps of the baseline validity tool /31/ were applied as follows: *Step 1: Assess the validity of the current baseline for the next crediting period* *Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies:* The EPIC validation team confirmed that as per the PDD applicable for the first crediting period, the baseline scenario is directly determined as "*atmospheric release of landfill gas*"[3].

[3] As confirmed by the EPIC validation team, the PDD for the currently expired 1st 7-year crediting period of the project activity also includes references to a small fraction of LFG that is assumed as combusted in the baseline scenario as follows:

> *"The baseline scenario has been defined as the atmospheric release of the landfill gas produced by waste in anaerobic conditions after reviewing:*
> *• Other alternatives*
> *• Legal and contractual obligation (existing and forthcoming)*
> *• Current practice of waste management sector in Brazil*
> *• Current practice on site*
>
> *(…)*
> *In the case of Tijuquinhas Landfill, there are no legal or contractual obligations to collect and combust landfill gas. Passive gas venting is the only mean used on site to collect landfill gas. Passive flaring is practised by*

	As confirmed by the EPIC validation team, the project activity meets the requirements and conditions for the effective continuation of the validity of the baseline scenario previously identified during the validation phase for the project activity in year 2008 under the provisions of the baseline and monitoring methodology ACM0001 (version 5) /27/. While ACM0001 (version 18.0) /5/ supersedes ACM0001 (version 5) /27/, the updated PDD /2/ correctly considered specific provisions and requirements of such more recent version of ACM0001 methodology for the determination of the baseline scenario. Section B.6.1 of the updated PDD /2/ includes the application of the stepwise approach of the applied methodology for the determination of the amount of methane that would have been captured and destroyed in the baseline scenario (absence of the CDM project activity) at the Tijuquinhas landfill. As confirmed by the EPIC validation team, although there is still no regional or national legal requirement in Brazil establishing LFG to be collected and destroyed in landfills, in the particular case of the Tijuquinhas landfill, a very small share of generated LFG flare was voluntarily combusted in previously existent pre-project LFG venting/combustion drains located in such landfill. Thus, the EPIC validation team was able to confirm that the demonstration of continuation of the baseline scenario for the project activity is thus in full compliance with mandatory national, regional and/or sectorial policies and requirements. *Step 1.2: Assess the impact of circumstances* By assuming the continuation of the validity of the previously identified baseline scenario for the project activity in the context of the renewal of its 7-year crediting period, it is thus assumed that there is no need to assess the impact of circumstances (such as availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions) and/or sectoral policies which have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period. This is deemed reasonable and acceptable. The updated PDD /2/ appropriately emphasizes that the previously identified baseline scenario for the project activity is demonstrated as not changed at the time of requesting renewal of the crediting period. The EPIC validation team had confirmed that apart from the Brazilian National Policy on Waste Management (Decree No. 7,404/10), there are indeed no other relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or prior to the submission of the request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period. Details about the Brazilian National Policy on Waste Management (Decree No. 7,404/10) and its impacts over the baseline scenario for the project activity are correctly and appropriately included in Section B.4 of the updated PDD /2/. The conditions used to determine the baseline emissions in the previous crediting period are still valid in the context of the renewal of the crediting period of the project activity. In summary, the conditions and circumstances considered or taken into account to determine the baseline emissions for the project activity in its previous 7-year crediting period are correctly assumed as still being valid for its next crediting

igniting gas wells in order to diminish on site odour. As there is no suction applied on the wells, the efficiency of the actual gas collection is very low. In addition, passive flaring cannot be maintained and often the flame extinguishes itself after few minutes or few hours depending on the wells. Consequently, it has been estimated that less than 10% of the landfill gas is collected and burnt at the moment."

period.

It is thus correctly assumed that, in the absence of the project activity, major share of LFG generated at the Tijuquinhas landfill would still be freely emitted into the atmosphere (with a very reduced share of generated methane being destroyed in a set of conventional passive LFG venting/combustion drains in the year prior to the implementation of the project activity).
It is also sufficiently demonstrated that there is no change in the market or regulatory characteristics/aspects (including legal requirements) or new market or regulatory circumstances that would demand any type of re-assessment or re-evaluation for the determination of the baseline scenario for the 2nd 7-year renewable crediting period of the project activity.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewable is requested.
While the baseline scenario previously identified at the validation of the project activity was not selected as "*the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology",* application of step 1.3 is thus not applicable.

Step 1.4: Assessment of the validity of the data and parameters
The EPIC validation team confirmed that, while the PDD applicable for the currently expired 1st 7-year crediting period /3/ applies a not any longer valid version of the CDM baseline and monitoring methodology ACM0001 (version 5) /27/, some methodological requirements, ex-ante selected data and monitoring parameters as per such PDD are indeed no longer valid/applicable for the 2nd 7-year crediting period since the selected methodology is a more recently issued version of such previously applied methodology.
As outlined in the updated PDD /2/, the selected CDM baseline and monitoring methodology /5/ and the related methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ contain differentiated applicable methodological approaches (when compared to ACM0001 (version 5) /27/). Due to that, new data and ex-ante determined parameters are applied in the context of the demonstration of the validity of the previously derived baseline scenario and also applied in the ex-post determination of baseline emissions for the 2nd 7-year crediting period.

Further assessment of the application of the methodological approaches for the demonstration of validity of the previously derived baseline scenario is included below under Step 2.
The application of the methodological approach to determine baseline emissions for the 2nd 7-year crediting period as per the selected CDM baseline and monitoring methodology /5/ is further assessed under Section D.4.

Step 2: Update the current baseline and the data and parameters

Step 2.1 Update the current baseline
As appropriately outlined in the updated PDD /2/, while the previously determined baseline scenario for the project activity is still valid for its 2nd 7-year renewable crediting period, this Step is thus not applicable for the renewal of crediting period of the project activity.
Nonetheless, while the methodological approaches for the determination of baseline scenario and baseline emissions as per the selected CDM baseline and monitoring methodology /5/) is indeed different than the previously applied methodology ACM0001 (version 5) /27/, for completeness reasons, the updated PDD /2/ includes the whole determination of the baseline scenario and baseline emissions as per the applicable guidance and requirements and stepwise approaches of selected CDM baseline and monitoring methodology (regardless the fact that the baseline scenario remains being the same).

Assessment of the determination of the baseline scenario (in order to demonstrate

the continuation of earlier identified baseline scenario) by following applicable stepwise procedure of the "Combined tool to identify the baseline scenario and demonstrate additionality" as required by the selected CDM baseline and monitoring methodology:

The continuation of the previously identified baseline scenario for the project activity is correctly presented and demonstrated in the updated PDD /2/ through the application of the stepwise approach for determining baseline scenario as per the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/ as required by selected CDM baseline and monitoring methodology /5/ as follows:

STEP 0: Demonstration whether the proposed project activity is the First-of-its-kind:

As correctly indicated in the updated PDD /2/, this optional step is not applied for the renewal of the crediting period of a registered CDM project activity.

Step 1: Identification of alternative scenarios:

As part of application of Step 1, all applicable alternatives which are specified by ACM0001 (version 18.0) /5/ were correctly considered and analysed as follows:

Step 1a: Define alternative scenarios to the proposed CDM project activity

The following alternatives were initially considered:

LFG1: The project activity (i.e. capture of landfill gas and its flaring and/or its use) undertaken without being registered as a CDM project activity. This is a plausible alternative scenario, however involves significant investment and additional costs of landfill operations with no associated revenues.

LFG2: Atmospheric release of the landfill gas or partial capture of landfill gas and destruction in the Tijuquinhas landfill (which is regarded as a managed Solid Waste Disposal Site (SWDS)) in order to comply with regulations or contractual requirements, or to address safety and odour concerns. This scenario corresponds to the continuation of the current situation (the proposed project activity or any other alternatives are not implemented).

LFG3: Atmospheric release of the landfill gas or partial capture of landfill gas and destruction in an unmanaged SWDS in order to comply with regulations or contractual requirements, or to address safety and odour concerns.

LFG4: LFG is partially not generated because part of the organic fraction of the solid waste is recycled and not disposed in the SWDS;

LFG5: LFG is partially not generated because part of the organic fraction of the solid waste is treated aerobically and not disposed in the SWDS;

LFG6: LFG is partially not generated because part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS.

As correctly outlined in the updated PDD /2/, scenarios LFG3, LFG4, LFG5 and LFG 6 were not taken into account under the application of Step 1a since no changes in the solid waste disposal practices at the region of influence of the Tijuquinhas landfill, operation of the Tijuquinhas landfill is expected to occur or had ever occurred as a result of the previously occurred implementation and operation of the project activity during its currently expired 1st 7-year crediting period and/or neither during its 2nd 7-year crediting period. Therefore it is deemed appropriate to exclude LFG3, LFG4, LFG 5 and LFG6 from the list of alternative scenarios.

While the design of the proposed project activity does not encompass any utilization of collected LFG as gaseous fuel for electricity or heat generation, supply

of LFG to a natural gas distribution network or distribution of LFG compressed/liquefied using trucks, alternative scenarios related the use (utilization) of LFG were thus not identified. This is deemed correct since utilization of LFG is not encompassed by the project activity as per the project design. This is in accordance to ACM0001 (version 18.0) /5/.

Outcome of Step 1a:
As the outcome of application of Step 1a of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/ the realistic and credible alternatives remained (as defined by ACM0001 (version 18.0) /5/ are identified as LFG1 and LFG2.
The EPIC validation team considers the list of realistic and credible alternatives after the application of Step 1a of the methodological tool to be complete, correct and appropriate.

Step 1b: Consistency with mandatory applicable laws and regulations:

As outlined in the updated PDD /2/, the list of alternatives left after application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/ is the same as after application of Step 1b of the methodological tool: LFG1 and LFG2.

The following is correctly indicated in the updated PDD /2/

> *"(...) So far, there are still no legal restrictions or requirements for LFG collection and destruction in Brazil, neither for passive venting of LFG. Therefore the remaining alternatives LFG1 and LFG2 are both in compliance with all applicable mandatory laws and regulations.*"

The EPIC validation team was able to confirm that indeed there is no legislation requiring the collection and destruction of landfill gas in Brazil. Moreover, the validation team was also able to confirm that collection and destruction of landfill gas is not forbidden in Brazil either.

Outcome of Step 1b:
As the outcome of application of Step 1b of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/, the realistic and credible alternatives left (as defined by the selected CDM baseline and monitoring methodology) /5/ are identified as LFG1 and LFG2. The EPIC validation team considers the list of realistic and credible alternatives after the application of Step 1b of the methodological tool to be correct, complete and appropriate.

Step 2: Barrier analysis + STEP 3: Investment analysis + STEP 4: Common practice analysis

The following is correctly outlined in the updated PDD /2/:

> *"(…) As per the applicable methodological guidance of both ACM0001 (version 18.0) and the "Combined tool to identify the baseline scenario and demonstrate additionality", determining baseline scenario for a LFG collection and destruction/utilization initiative proposed as a CDM project activity is somehow combined with assessing and demonstrating additionality for such proposed CDM project activity.*
>
> *While in the particular situation of the renewal of the 7-year crediting period of a registered CDM project activity it is not required to assess and demonstrate the validity of the earlier assessed/demonstrated additionality (of which in the particular case of the "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project" was previously assessed and demonstrated as presented in the latest version of the PDD valid for the 1st* 7-year crediting period (PDD version 4.3, dated July 2011)*, the application of STEP 2, STEP 3 and STEP 4 are thus regarded as not applicable/required in the context of the demonstration of the continuation of the previously identified baseline scenario for the project activity during its 2nd 7-year crediting period (as a requirement for the renewal of the*

	crediting period). This is in accordance with the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" and other applicable CDM guidelines and rules." Based on review of previously made available information related to the assessment and demonstration of additionality of the project activity (as made available in the latest version of the PDD /3/ valid for the its currently expired 1st 7-year crediting period), the EPIC validation team was able to confirm that, as appropriately and sufficiently outlined in the updated PDD /2/, the proposed project activity without CDM benefits does not represent a plausible. Thus, the alternative scenario LFG1 is also appropriately excluded as an alternative scenario and the only remaining alternative is the alternative LFG2 (atmospheric release of the LFG or partial capture of LFG and destruction to comply with regulations or contractual requirements, or to address safety and odors concerns). <u>*Conclusion about the determination of baseline scenario:*</u> As a conclusion, the EPIC validation team was able to confirm that alternative LFG2 (atmospheric release of the landfill gas or, eventually, partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns) is correctly identified as the only realistic alternative valid for the 2nd 7-year crediting of the project activity as per the project design configuration valid for its renewal of crediting period. As further assessed under assessment details for the determination of $F_{CH4,BL,y}$, it is correctly assumed that in the absence of the project activity LFG would have been released in an uncontrolled manner to the atmosphere with a very small share of methane generated at the Tijuquinhas landfill being destroyed by combustion in conventional passive LFG venting/combustion drains that were previously existent at this particular landfill site. The EPIC validation team confirms that the identified baseline scenario is correctly determined as per applicable guidance of the selected CDM baseline and monitoring methodology /5/ and the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0) /30/). The application of guidance of the selected CDM baseline and monitoring methodology /5/ in the context of the determination of the continuation of the previously identified baseline scenario is also confirmed to be deemed transparent and correct. The identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity. It is the opinion of the EPIC validation team that the application of the stepwise approach of the baseline validity tool /31/ for demonstrating the validity of the previously derived baseline scenario for the project activity" is deemed reasonable and correct. In summary, in accordance with applicable requirements from the CDM-VVS for PA (version 01.0) /1/, the EPIC validation team confirmed that the application of the stepwise approach of the baseline validity tool /31/ for demonstrating the validity of the previously derived baseline scenario for the project activity" is deemed reasonable and correct. It is sufficiently demonstrated that the previously determined baseline scenario for the project activity (scenario that represents GHG emissions that would occur in the absence of the project activity) is still valid. While the previously performed identification of the baseline scenario for the project activity (previously reported in the PDD /3/ applicable for the first crediting period) is also reported in the updated PDD /2/, the EPIC validation team has verified that the procedure contained in the selected CDM baseline and monitoring methodology to identify the most reasonable baseline scenario was correctly applied in the updated PDD /2/.

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	In accordance with the Paragraph 415 a) clause iv of the CDM-VVS for PA (version

	1.0) [1], the EPIC validation team appointed by EPIC reviewed whether the calculation of emission reductions is correct against the requirements of the applied methodology.
Findings	One Clarification Request (CL) and two Corrective Action Requests (CARs) were raised by the EPIC validation team regarding the calculation of emission reductions as per applicable requirements of the applied methodology: CL 1: Sufficient details and documented evidences about the determination of the selected value for the ex-ante determined (fixed) parameter "Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity"($F_{CH4,BL,x-1}$) are to be provided. CAR 5 The value for the calculation parameter "Amount of methane in the LFG generated in the SWDS in the year prior to the implementation of the project activity" ($F_{CH4,x-1}$) as valid for year 2007 and directly applied for the determination of the calculation parameter "Historical amount of methane in the LFG which is captured and destroyed" ($F_{CH4,hist,y}$) is not consistent with value of methane generation for this particular year 2007 as indicated in the sheet "FOD Calculations" of the provided emission reduction calculation spreadsheet. CAR 6 Formula applied in the emission reduction calculating spreadsheet for ex-ante estimates of annual values for baseline emissions of methane (BE_{CH4}) is incorrect.
Conclusion	As a conclusion of its assessment, upon successfully closure of the raised CL and CARs, the EPIC validation team confirmed the correctness of ex-ante estimates of emission reductions to be achieved by the project activity during its 2nd 7-year crediting period. As outlined in the updated PDD [2], calculations of GHG emissions reductions to be achieved by the project activity during the 2nd 7-year crediting period are based on the application of the ACM0001 (version 18.0) [5] and the applicable methodological tools [10] [11] [12] [13] [14] [31] [32]. In accordance with the ACM0001 (version 18.0) [5], no leakage emissions are required to be accounted. GHG emissions reductions (ER_y) to be achieved by the project activity during the 2nd 7-year crediting period are defined as the difference between baseline emissions (BE_y) and project emissions (PE_y). Assessment details for the determination of BE_y and PE_y are included in Appendix 6 of this Validation Report. The EPIC validation team confirmed that application of algorithms and formulae for the determination of emission reductions achieved during the 2nd 7-year crediting period is correct and deemed reasonable. Assessment details for the application of algorithms and formulae for the determination of emission reductions achieved during the 2nd 7-year crediting period are included below in Appendix 6.

D.5. Validity of monitoring plan

Means of validation	In accordance with Paragraph 415 a) clause iv of the CDM-VVS for PA (version 01.0) [1], the validation team appointed by EPIC reviewed whether monitoring plan mentioned in the initial PDD [2] is valid and correct.
Findings	No CARs and/or CLs were raised regarding the validity and design of the monitoring plan of the project activity.
Conclusion	As established by the ACM0001 (version 18.0) [5] and applicable methodological tools [10] [11] [12] [13] [14] [31] [32], in the context of the ex-post determination of baseline emissions for the project activity, the monitoring system for the project activity during its 2nd 7-year crediting period basically consists of measuring the amount of

	methane actually combusted (destroyed) in the high temperature enclosed flares + assessment of the operational conditions of the Tijuquinhas landfill (via measurements/monitoring of the parameters monitored *ex-post* which are summarized in the table below). Project emissions resulting from flaring of collected LFG ($PE_{flare,y}$) will also be calculated as part of the determination of baseline emissions for the project activity by following applicable measurements and calculations requirements as defined in the tool "Project emissions from flaring" (version 02.0.0) /10/. Finally, project emissions due to the consumption by the project activity of grid-sourced electricity will be determined by applying related monitoring requirements as per the applicable methodology. As appropriately indicated in the updated PDD /2/ and in conformance with currently applicable guidance for completing the CDM-PDD form /17/, all the monitoring equipment and instruments will be maintained and managed in accordance with maintenance (service) and calibration requirements and recommendations defined by the equipment/instrument manufacturers. It has also been indicated in the updated PDD /2/, measurement checking and calibration of the monitoring equipment/instruments will be performed on a regular basis as per manufacturer's related requirements in order to ensure the correct measurement of data to be monitored. LFG flaring equipment will also be maintained as per recommendations of the equipment manufacturer. Monitoring information/data of flare equipment maintenance will be recorded and reported as required by the selected CDM baseline and monitoring methodology /5/ and by the methodological tool "Project emissions from flaring" (version 02.0.0) /10/. It is the opinion of the EPIC validation team that the revised monitoring plan will give opportunity for real measurements of achieved emission reductions. All the data pertaining to monitoring parameters will be archived for at least two years after the end of crediting period. General details of the data to be collected, frequency of data recording, and the project management responsibilities are defined and are also clearly defined in the monitoring plan of the updated PDD /2/. It is the opinion of the EPIC validation team that the revised monitoring plan, as described in the updated PDD /2/, is feasible for the project participant. As outlined in the updated PDD /2/, maintenance service and routines for project's equipment and instruments include all required preventive and corrective actions in order to ensure appropriate functioning of all project related equipment. Related maintenance activities include visual control of the equipment state and real-time check of displayed parameters; cleaning up the equipment and the sensors; lubrication and greasing; replacement or overhauling of defective parts (including regular welding service in the HDPE pipelines and manifolds). Furthermore, as also outlined in the updated PDD /2/, spare units for some of the monitoring instruments/equipment will eventually be kept on-site. It has been indicated in the updated PDD /2/ that an appropriate and revised project's operational and management structure is considered for the 2nd 7-year crediting period. Such operational and management structure will rely on staff with responsibilities to be clearly defined; where all collaborators and employees involved with operation of project and/or monitoring will receive appropriate training. Training of operational and management staff will encompass general competence development about LFG generation and collection; review of equipment operational principles; maintenance and calibration requirements for project's related equipment; procedures for monitoring data gathering and handling as well as emergency and safety procedures. In summary, it is the opinion of the EPIC validation team that the description and design of the revised monitoring plan as per the updated PDD /2/ complies with all the monitoring requirements of the ACM0001 (version 18.0) /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. Such description is also under conformance with currently applicable guidelines for completing the CDM-PDD form /17/. It is also the opinion of the EPIC validation team that the project participant will

	be able to implement and operate the monitoring plan during the 2nd 7-year crediting period. *Assessment of information added in the PDD regarding parameters to be monitored ex-post:* The updated PDD /2/ correctly includes in Sections B.7.1 and B.7.3 details about the parameters to be monitored *ex-post* during the 2nd 7-year renewable crediting period for which assessment is also included in Appendix 7 of this Validation Report. As established by ACM0001 (version 18.0) /5/ and by the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ and also appropriately outlined in the updated PDD /2/, the volumetric or mass flow of landfill gas captured ($V_{t,wb/db,j}$ or $M_{t,db,j}$) and the methane fraction in the landfill gas ($v_{CH4,t,db/wb,j}$) will be continuously measured in the same basis (dry or wet). The selection of the parameters monitored *ex-post* and their monitoring procedures as outlined in updated PDD /2/, are deemed complete, transparent and in accordance with requirements of the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. Assessment details for the selection and definition of parameters to monitored ex-post and applied monitoring approaches: *Assessment of information added in the PDD regarding management system and quality assurance for the monitoring process:* The monitoring plan for the project activity, as outlined in the updated PDD /2/, includes inter alia, sufficient details about the following management and quality related aspects: - General description of the staff responsibilities and authorities for project management; - General description about procedures for data gathering and data reconciliation and reporting; - General description about monitoring equipment/instruments; - General information about calibration requirements of monitoring equipment/instruments; - General information about data quality control, training, data management system, reporting and verification of data (data reconciliation). A general and sufficient description of the monitoring plan is elaborated in the updated PDD /2/ applying the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. The monitoring plan has been established in order to enable subsequent verification of emission reductions for the project activity during the 2nd 7-year renewable crediting period for which periodic verification(s) are yet to be performed. The application of the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ is deemed transparent. By taking into account verified previously issued Monitoring Reports valid for the 1st 7-year crediting period /22/, the EPIC validation team considers the project participants potentially able and competent enough to monitor the project activity as per the monitoring plan valid for the 2nd 7-year crediting period. The monitoring plan as per the updated PDD /2/ indicates that all monitoring instruments and equipment will remain being calibrated as per manufacturer recommendations and/or as per international standards. Operational data relevant for emission reduction accounting for the project activity will remain being logged continuously by using automated computerized data logger and storage system. For the 2nd 7-year crediting period, data records will remain being stored on an appropriate computer software or data recording system where daily log-sheet files will serve for backup and crosscheck purpose and archived at project site. Monthly project performance reports will be made available at both the project site and administrative office in both electronic copy and hard copy to ensure data integrity.

	All monitoring data will be kept up to 2 years after the end of crediting period. Training of operational staff for the relevant data record keeping, operation and maintenance related procedures are also considered. Moreover, staff will continue to be trained on procedures for applicable corrective actions. It is the opinion of the EPIC validation team that the description of the monitoring procedures for the project activity as described in the updated PDD /2/ is deemed complete, reasonable and its implementation is potentially feasible for the project participants. Through document check and performed phone interview with representatives of the project participant, it is verified that the monitoring plan as described in the updated PDD /2/ provides sufficient information and it is described in compliance with the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. As a conclusion, the EPIC validation team has confirmed that the monitoring plan of the updated PDD /2/ (as well as other sections of the PDD that describes the approaches to be applied for the determination of related baseline and project emissions) is correctly completed in the updated PDD /2/. It is the opinion of the EPIC validation team that the descriptions of the monitoring plan (and descriptions in related sections of the updated PDD /2/ describing the approaches for determining baseline and project emissions) do not negatively affect the accuracy and correctness of the determination of baseline emissions. The monitoring plan for the project activity, as outlined in Section B.7.1 and B.7.3 of the updated PDD /2/, meets all requirements and criteria of the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/. Sections B.7.1 and B.7.3 of the updated PDD /2/ were also confirmed by the EPIC validation team to be completed in full compliance with applicable guidance for completing the latest version of the CDM-PDD form (version 06.0) /17/. *Assessment of applicability of the selected CDM baseline and monitoring methodology* /5/ *+ applicable methodological tools:* While the PDD /2/ applies the selected methodology ACM0001 (version 18.0) /5/ and applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/, the validation assessment has also assessed the compliance of the project activity with the applicability criteria and requirements for such methodology and methodological tools that the PDD /2/ refers to. Through the performed document checking and background research, it was confirmed by the EPIC validation team that the selected methodology ACM0001 (version 18.0) /5/ + all applicable methodological tools /10/ /11/ /12/ /13/ /14/ /31/ /32/ are correctly applied in the context of the completion of the updated PDD /2/. Details about the assessment of meeting of applicability conditions of such methodology and methodological tools are included in Appendix 5 of this Validation Report. In summary, the EPIC validation team confirmed that the description of the monitoring plan valid during the 2nd 7-year renewable crediting period is in accordance with the selected CDM baseline and monitoring methodology /5/ and applicable methodological tools.

D.6. Crediting period

Means of validation	In accordance with Paragraph 415 a (clause v) of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by EPIC reviewed whether the starting date and length of the 2nd crediting period, as outlined in the final PDD /2/, meets all applicable requirements for renewal of crediting period.
Findings	No CARs and/or CLs were raised regarding the selected starting date for the 2nd 7-year crediting period of the project activity.
Conclusion	The 2nd 7-year crediting period is defined in the updated PDD /2/ as starting on 29/10/2015 and ending on 28/10/2022. As part of its assessment, the EPIC validation team confirmed that consideration of expected operational lifetime for pre-project equipment installed at the project site for the determination of the length of the crediting period is not relevant/applicable in the particular case of the project activity. As confirmed by the EPIC validation team, the host-country project participant and project owner Proactiva Meio Ambiente – Brasil has successfully notified the Secretariat of the CDM Executive Board (CDM-EB) on 07/03/2018 of the intention of this project participant to request a renewal of the crediting period of the project activity by submitting a draft version of the updated PDD (version 5.0, dated 13/01/2018) and informing of the selection of EPIC as the validating DOE. The project participants are aware that it will not be possible to claim emission reductions eventually achieved by the project activity right from the starting date of the 2nd 7-year crediting period of the project activity as indicated in the updated PDD /2/. The EPIC validation team thus confirms that having the indication in the updated PDD of the 2nd 7-year crediting period starting on 29/10/2015 and ending on 28/10/2022 is deemed correct and in full compliance with all applicable requirements.

D.7. Project participants

Means of validation	In accordance with paragraph 415 clause a) *vi* of the CDM-VVS for PA (version 01.0) /1/, the validation team appointed by EPIC checked the names of the project participants included in the updated PDD /2/ against the name included in the previously issued PDD /3/ applicable to the currently expired 1st 7-year crediting period of the project activity as well as in the UNFCCC website.
Findings	No CARs and/or CLs were raised regarding the Project Participants of project activity:
Conclusion	The EPIC validation team has confirmed the correctness of corporate identity of all project participants as included in the updated PDD /2/ against information included in the latest version of the completed Modalities of Communication (MoC) form /36/ for the project activity.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines	N	N/A	N/A
Corrections	N	N/A	N/A
Change to the start date of the crediting period of the project activity	N	N/A	N/A
Inclusion of a monitoring plan	N	N/A	N/A

Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools	N	N/A	N/A
Changes to the project design	N	N/A	N/A
Changes specific to afforestation and reforestation project activities	N	N/A	N/A

SECTION E. Internal quality control

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EPIC has established an internal quality control process under which all documentation (including the validation opinion and the validation checklist) undergo an internal quality control process as a final step of the performed validation assessment. A Technical Review Committee is appointed to review the Validation Report prior of its approval The comments made by the Technical Review Committee are taken into consideration and incorporated in the final report by the appointed validation team (i.e. each report has to be finally approved either by the head of the technical review committee or the deputy). In case one of these two persons is part of the validation team approval can only be given by the other one. The final report (after resolutions of all findings) is then submitted to the CDM Quality Manager for final review and approval. After confirmation of the project participants the validation opinion and relevant documents are submitted to the CDM-EB through the UNFCCC web-platform.

SECTION F. Validation opinion

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EPIC Sustainability Services Pvt. Ltd. (EPIC) performed the validation assessment for the updated Project Design Document (PDD) valid for 2nd 7-year crediting period for the registered CDM project activity titled "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project" in the context of its renewal of the crediting period (2nd 7-year renewable crediting period starting on 29/10/2015 and ending on 28/10/2022). The project activity was previously registered by the UNFCCC on 13/08/2008 as CDM project activity with registration no. 1506.

The validation was performed in accordance with CDM Validation and Verification Standard for Project Activities (CDM-VVS for PA) (version 01.0) and included the assessment of the following issues:

- Evaluation of impact(s) of new relevant national and/or regional policies, circumstances and regulations on the previously determined baseline for the confirmation of the validity of the previously derived baseline taking into account relevant guidance from the CDM Executive Board (CDM-EB) with regards to renewal of the crediting period at the time of requesting renewal of crediting period;
  Evaluation of the correctness of the application of the CDM baseline and monitoring methodology ACM0001 (version 18.0) and applicable methodological tools in the updated PDD;
- Assessment of calculations and reporting of estimates of emission reductions to be achieved by the project activity during the 2nd 7-year crediting period;
- On-site inspection to the project site.

The review of the updated PDD (version 7.0, dated 07/05/2018) and the subsequently performed on-site visit to the project site and follow-up interviews with the project participants has provided the validation team appointed by EPIC with sufficient evidence to determine the validity of the original and previously identified baseline scenario. The EPIC validation team confirmed that the updated PDD (version 7.0, dated 07/05/2018) correctly applies the selected CDM baseline and monitoring methodology ACM0001 (version 18.0) + applicable methodological tools. The EPIC validation team also assessed a spreadsheet with calculations of *ex-ante* estimations of emission reductions to be achieved by the project activity during its 2nd 7-year renewable crediting period. Such spreadsheet is enclosed to the updated PDD.

The EPIC validation team appointed by EPIC is of the opinion that the project activity has the potential to achieve GHG emission reductions during the 2nd 7-year crediting period as per ex-ante estimates of emission reductions indicated in the updated PDD. As conformed by the EPIC validation team, all explanations and justifications provided by the project participants regarding information and assumptions added in the updated PDD (version 7.0, dated 07/05/2018) are deemed reasonable and acceptable.

In summary, it is EPIC opinion, that the CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project" meets all the relevant requirements for the renewal of the crediting period. Hence EPIC recommends the renewal of the crediting period of this project activity.

Prepared by	Approved by :
 (Marco A. Ratton) Validation Team Leader	 (K. Sudheendra) Director & Head-Operations

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology (CDM baseline and monitoring methodology)
CAR	Corrective Action Request
CDM-EB	CDM Executive Board (the board)
CDM-PCP for PA	CDM Project Cycle Procedure for Project Activities
CDM-PS for PA	CDM Project Standard for Project Activities
CDM-VVS for PA	CDM Validation and Verification Standard for Project Activities
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification Request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DOE	Designated Operational Entity
ER	Emission Reduction
GHG	Greenhouse gas(es)
LFG	Landfill gas
MP	Monitoring Plan
MR	Monitoring Report
PAHO	Pan American Health Organization
PDD	Project Design Document
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
UNFCCC	United Nations Framework Convention on Climate Change

Appendix 2. Competence of team members and technical reviewers

All personnel being engaged in CDM validation assessments performed by EPIC are qualified based on the established procedures of EPIC to assure the resource requirements that satisfy all the requirements of competence criteria of the CDM Accreditation Standard for operational entities. EPIC is accredited as a DOE and holds the full responsibility on decision-making regarding the validation assessment in accordance with the accreditation requirements of the CDM-EB.

The following validation team has been assigned to carry out the validation assessment for renewal of crediting period of the project.

Name	**Mr. Marco A. Ratton**	**Dr G. Vishnu**	**Mr. R. Vijayaraghavan**
Role	Lead Auditor	Auditor	Technical Reviewer
Competence in relevant sectoral scope(s):	Sectoral scope 13	N/A	Sectoral scope 13
Responsibility	Performance of document review, performance of on-site visit, preparation of initial list of findings, assessment of responses from the project participants for all list of findings and assessment of updated/corrected documents, completion of the and draft Validation Report, addressing eventual comments from the performed technical review and preparation of final Validation Report.	Review of documents, assistance in Validation Report completion	Performance of Technical review

Mr. Marco A. Ratton is based in Brazil and has acted as a CDM auditor since 2007. He holds vast experience with independent assessments of CDM project activities within the area of solid waste management and effluent treatment implemented in Latin America and other regions. He also has previous working experience with planning of municipal waste management as well as educational background in mechanical fabrication & manufacturing technologies, economics and environmental management & policy. He has undergone extensive training on CDM validation and verification and is a qualified Lead Auditor for Sectoral Scope 13 under Technical Area “Waste handling and disposal” and Sector Scope 1 in accordance with procedures of EPIC sustainability services Pvt. Ltd. He also has previous experience on conducting ISO 9001/14001 assessments.

Dr. G. Vishnu holds a Masters and Doctorate in Environmental Science. He has around 8 years of experience in the field of research and consultancy related to water, wastewater, solid waste management systems, implementation of new, Cleaner Production technologies and biomass assessment studies. He has more than four years’ experience in validation verification of more than thirty CDM, projects and has undergone extensive training on GHG validation and verification. He is a Lead Auditor for various technical areas. He is also an ISO 26000 lead auditor and ISO 50001 auditor certified by Professional Evaluation and Certification Board (PECB). He is a Certified

Sustainability Assurance Practitioner (CSAP) from AccountAbility, UK. He is qualified as Lead Auditor based on EPICs CDM accreditation procedures.

Mr. R. Vijayaraghavan holds BE in Mechanical Engineering, M.Tech in Energy Conservation and Management and MBA in Technology Management. He is certified as Energy Auditor by Bureau of Energy Efficiency (BEE), Government of India. He has 14 years of working experience in energy sector including validation / verification of more than 120 CDM, VCS & GS projects and has undergone extensive training on CDM validation and verification and has been qualified as Lead Auditor with Sectoral Scope 1 and 13.

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	UNFCCC/CDM-EB	Clean Development Mechanism Validation and Verification Standard for Project Activity (CDM-VVS for PA), version 01.0 as per EB 93, Annex 5	Dated 03/03/2017. Available online: http://cdm.unfccc.int/Reference/Standards/index.html	Others
/2/	Proactiva Meio Ambiente – Brasil	Project Design Document (PDD) for the 2nd 7-year crediting period of the registered CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project". (version 7.0).	Dated 07/05/2018	Project Participants
/3/	Proactiva Meio Ambiente – Brasil	Project Design Document (PDD) valid for the 1st 7-year crediting period for the CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project". (version 4.3).	Dated July/2011 Available online: https://cdm.unfccc.int/filestorage/3/U/9/3U902IL1KRXM4VFDPOH586GBCSENWY/1506%202%20Revised%20PDD.pdf?t=WFN8cDM5d2kzfDDow46vk2EtyEFR35Ga_ZA5	Project Participants
/4/	Proactiva Meio Ambiente – Brasil	Emission reduction calculation spreadsheet with *ex-ante* estimations of emission reductions to be achieved by the CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project" during the 2nd 7-year renewable crediting period. Version 7.0. File name: "*CER Tijuquinhas - V 7.0-07052018*"	Dated 07/05/2018.	Project Participants
/5/	UNFCCC/CDM-EB	Consolidated baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas", version 18.0	Dated 13/05/2016. Available online: https://cdm.unfccc.int/methodologies/DB/Y88077XT5O83TZ2PYEZ36LFIAMAODR	Others
/6/	UNFCCC	Kyoto Protocol to the United Nations Framework Convention on Climate Change	Dated 1998. Available online: http://unfccc.int/resource/docs/convkp/kpeng.pdf	Others
/7/	UNFCCC	Decision 3/CMP. 1 (Marrakesh – Accords)	Dated 30/03/2006. Available online: https://cdm.unfccc.int/Reference/COPMOP/08a01.pdf	Others
/8/	Det Norske Veritas	Validation Report for the CDM	Dated 04/12/2007.	Others

	A/S	project activity “Proactiva Tijuquinhas Landfill Gas Capture and Flaring project”. Rep. no. 2006-2100.	Available online: https://cdm.unfccc.int/filestorage/R/0/L/R0LZZ5FCQB2CW8TKMD8U247OF55ZY1/1506%20validation%20report%20revised2.pdf?t=YlB8cDM5d2k5fDCjnQhWjd_OojwqqGLAI6g4	
/9/	IPCC	1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book; 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book.	Available online: http://www.ipcc-nggip.iges.or.jp/public/gl/invs5.html http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html	Others
/10/	UNFCCC/CDM-EB	“Project emissions from flaring”, version 02.0.0.	Dated 20/07/2012. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf/history_view	Others
/11/	UNFCCC/CDM-EB	Methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0)	Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf	Others
/12/	UNFCCC/CDM-EB	Methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0)	Dated 27/11/2015. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf	Others
/13/	UNFCCC/CDM-EB	“Tool to calculate the emission factor for an electricity system” (version 06.0)	Dated 01/11/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.pdf	Others
/14/	UNFCCC/CDM-EB	“Emissions from solid waste disposal sites” (version 08.0).	Dated 04/05/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf	Others
/15/	UNFCCC/CDM-EB	CDM Project Standard for Project Activity (CDM-PS for PA), version 01.0	Dated 03/03/2017. Available online: http://cdm.unfccc.int/Reference/Standards/index.html	Others
/16/	UNFCCC/CDM-EB	CDM Project Cycle Procedure for Project Activity (CDM-PCP for PA), version 01.0	Dated 03/03/2017. Available online: http://cdm.unfccc.int/Reference/Procedures/i	Others

			ndex.html#proj_cycle	
/17/	UNFCCC	Project design document form for CDM project activities (incl. the Attachment. Instructions for completing this form", version 10.1.	Dated 28/06/2017. Available online: https://cdm.unfccc.int/Reference/PDDs_Forms/index.html	Others
/18/	Federal Government of Brazil	Federal Resolution CONAMA nº 001/86.	Dated 23/01/1986. Available online: http://www.mma.gov.br/port/conama/res/res86/res0186.html	Others
/19/	UNFCCC/CDM-EB	Standard for application of the global warming potentials to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol. Version 01.0	Dated 13/09/2012. Available online: https://cdm.unfccc.int/faq/Reference/Standards/meth/reg_stan02.pdf Others	Others
/20/	Huitric, R. L. and Kong, D. et al	"Measuring landfill gas collection efficiency using surface methane concentration"	Available online : http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf	Others
/21/	GRS VALTECH	Instructions Manual for the 2 high temperature enclosed flares currently installed at the Tijuquinhas landfill as part of the CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project".	-	Others
/22/	Proactiva Meio Ambiente – Brasil	Monitoring Reports for all previous performed verification assessments within the currently expired 1st 7-year crediting period of the registered CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project" + Related Verification Reports	Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1200058130.23/view	Project Participants
/23/	DNA of Brazil	Resolução de nº 8, de 26 de maio de 2008, que adota, para fins de atividade de projeto de MDL, um único sistema como definição de sistema elétrico do projeto no Sistema Interligado Nacional. (Resolution no. 8, that adopts a single national electricity grid for CDM Project activities).	Dated 26/05/2008. Available online: http://www.mct.gov.br/upd_blob/0024/24719.pdf	Others
/24/	Federal Republic of Brazil, Ministry of Environment	"Gestão integrada de resíduos sólidos"	Dated 2007.	Others
/25/	Federal Republic of Brazil ,Ministry of Science and Technology	The second Brazilian Greenhouse Gases Emissions Inventory Report."	Dated 2010. Available online: http://www.mct.gov.br/upd_blob/0213/213909.pdf	Others
/26/	ABRELPE	"Panorama dos Resíduos Sólidos no Brasil- 2014".	Available online: http://www.abrelpe.org.br/panorama_apresentacao.cfm	Others

/27/	UNFCCC/CDM-EB	Consolidated baseline and monitoring methodology ACM0001 - "Flaring or use of landfill gas", version 05.0	Dated 15/12/2006. Available online: https://cdm.unfccc.int/methodologies/DB/Y88077XT5O83TZ2PYEZ36LFIAMAODR	Others
/27/	Proactiva Meio Ambiente – Brasil	Historical measurements of methane in the LFG which was captured and destroyed in the Tijuquinhas landfill in the year prior to the implementation of the project activity. (related to year 2007).	Dated 15/01/2008.	Project participants
/28/	FATMA	Operational license for the Tijuquinhas landfill	-	Others
/29/	Brazilian Ministry of City Infrastructure	Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2010 (translated into English language as "Outlook/diagnostic for municipal/urban solid waste management – year 2010).	Dated June 2012. Available online: http://www.snis.gov.br/PaginaCarrega.php?EWRErterterTERTer=93	Others
/30/	UNFCCC/CDM-EB	"Combined tool to identify the baseline scenario and demonstrate additionality", version 07.0.	Dated 22/09/2017. Available online: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf	Others
/31/	UNFCCC/CDM-EB	Methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period", version 03.0.1 as per EB 66.	Dated 02/03/2012. Available online: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf	Others
/32/	Pan American Health Organization (PAHO)	"Analysis of the municipal solid waste management situation – Report on the regional evaluation of municipal solid waste management services in Latin America and the Caribbean".	Dated year 2005. Available online: http://www.bvsde.ops-oms.org/bvsars/fulltext/informeng/cap3.pdf	Others
/33/	Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke	Fundamentals of Classical Thermodynamics; 3rd Edition, John Wiley & Sons, Inc. Table A-4: Saturated Water-Temperature.	Dated 1996. Available online: http://fireflylabs.com/disted/courses/m275-data(all%20years)/SaturatedWaterTables-T&P.pdf	Others
/34/	Proactiva Meio Ambiente – Brasil	Completed Modalities of Communication (MoC) form for the CDM project activity "Proactiva Tijuquinhas Landfill Gas Capture and Flaring project"	Valid as 21/09/2011. Available online: https://cdm.unfccc.int/Projects/DB/DNV-CUK1200058130.23/view	Project Participants
/35/	Brazil's Interministerial Commission on Global Climate Change (DNA of Brazil)	CO_2 emission factors for electricity generation in Brazil National Interconnected System – Base year 2015.	Available online: http://www.mct.gov.br/index.php/content/view/307492.html	Others

/36/	UNFCCC/CDM-EB	List of valid standardized baselines applicable for CDM project activities.	Available online: https://cdm.unfccc.int/methodologies/standard_base/new/sb7_index.html	Others
/37/	UniCarbo/UNFCCC/CDM-EB	Submitted inquire in the context of communications directed to the CDM Executive Board (previously known as 'Letter to the Board') with the title "*320_INQ-01231-G8Q1_Request of clarification about issues related to the renewal of crediting period of CDM project activities*" (dated 23/10/2013), including the response from the CDM-EB.	Available online: https://cdm.unfccc.int/filestorage/e/x/t/extfile-20131025150150715-320_INQ-01231-G8Q1_Unicarbo_FORM.pdf/320_INQ-01231-G8Q1_Unicarbo_FORM.pdf?t=ME58b2U0M2RifDDAttB_nXkp7KWjoxuEQhuK and https://cdm.unfccc.int/filestorage/e/x/t/extfile-20131220113003559-320_INQ-1231-G8Q1_Unicarbo_Response.pdf/320_INQ-1231-G8Q1_Unicarbo_Response.pdf?t=STJ8b2U0M3B3fDCpQil5om2ZxoJcBmxhU3Gy	Others
/38/	Proactiva Meio Ambiente - Brasil	Sheet summarizing related measurements and calculations for evaluation work encompassing systematic measurements of flow and CH_4 content in LFG directly emitted from 66 LFG venting/combustion drains existent at the Tijuquinhas landfill in year 2007	Dated 2008	Project participants
/39/	LANDTEC North America, Inc.	Specification sheet for LANDTEC Accu-Flo Wellhead.	Avaialble online: http://www.landtecna.com/wp-content/uploads/2017/04/AccuFloWellhead_2017_master_cutsheet2382_reduced.pdf	Others
/40/	LANDTEC North America, Inc.	Specification sheet for LANDTEC Wellbore Seals.	Avaialble online: http://www.landtecna.com/wp-content/uploads/2017/04/Wellbore_2017_master_cutsheet_2389_reduced.compressed.pdf	Others
/41/	LANDTEC North America, Inc.	Product catalogue incl. specification sheet for LANDTEC GEN2000 series $CH_4/CO_2/O_2$ gas analyzer	Avaialble online: http://www.norskanalyse.no/files/57777.pdf	Others

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	1	**Section no.**	D.4	**Date:** 04/05/2018
Description of CL				
Sufficient details and documented evidences about the determination of the selected value for the ex-ante determined (fixed) parameter "Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity"($F_{CH4,BL,x-1}$) are to be provided.				
Project participant response				**Date:** 07/05/2018
As a response to the raised CAR, the representatives of the project participant Proactiva Ambiental – Brasil clarifies that calculated value for the ex-ante determined (fixed) parameter "Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity"($F_{CH4,BL,x-1}$) represents the outcome of measurement campaing that was organized and performed by this project participant and project owner within year 2007 with support of contracted LFG experts. The performed campaing encompassed systematic measurements of flow and CH_4 content in LFG directly emitted from all the 66 pre-project passive LFG venting/combustion drains existent at the Tijuquinhas landfill prior of the implementation of the project activity. For performing related measurments, a set of inspection wellheads (specifically developed for installation on LFG extraction system with vertical LFG venting/combustion drains) were alternately positioned in the 66 LFG venting/combustion drains. The utilized set of set of inspection wellheads were designed, manufactured and supplied by LANDTEC North America, Inc., a leading provider of products and services in the landfill gas industry. The utilized set of inspection wellheads incorporate a built-in gas flow measurement device (a modified pitot tube), gas temperature port, quick-connect gas sample and pressure ports, flow control gate valve and flex-hose. Portable $CH_4/CO_2/O_2$ gas analyzer units also designed, manufactured and supplied by LANDTEC North America, Inc., were jointly used with the measuring wellheads for alternately measure (and record data) of CH_4 content in collected LFG + LFG flow in all the 66 pre-project LFG venting/combustion drains. As part of the performed measurement campaign, surface seals (impermeable membranes) also designed, manufactured and supplied by LANDTEC North America, Inc. were clamped onto the the LFG venting/combustion drains under measurement section in order to prevent LFG leaks and/or air intrusion through the surface surrounding the drains during the measurement period. By taking into consideration the results of the set of LFG flow and CH4 content measurements encompassed by the campaign in each one of the 66 pre-project passive LFG venting/combustion drains (12 sessions of encompassing 12 hour each) and also by applying representative extrapolations of suchs set of 12 measurement sessions x 66 drains for 24 hour per day within a 365-day period (which is encompassed by year 2007), the total amount of methane in the LFG which is captured and destroyed in this particular year (year prior to the implementation of the project activity) was determined as being 484 tCH4 as summarized in the compiled sheet summarizing related measurements and calculations.				
Documentation provided by project participant				
Sheet summarizing related measurements and calculations for evaluation work encompassing systematic measurements of flow and CH_4 content in LFG directly emitted from 66 LFG venting/combustion drains existent at the Tijuquinhas landfill as organized and performed by Proactiva Ambiental – Brasil within year 2007.				
DOE assessment				**Date:** 14/05/2018

As confirmed by the EPIC assessment team, related clarifications provided by the project participants + provided documented evidence sufficiently address the raised CL. Furthermore, performed editings in related information in the updated PDD are deemed reasonable and correct. By taking into account the design and operational conditions of the Tijuquinhas landfill, it is EPIC opinion that deriving the value for the parameter FCH4,BL,x-1 (value for year 2007) based on the results of previously performed systematic evaluation work encompassing deemed measurement campaign of flow and CH4 content in LFG directly emitted from the 66 LFG venting/combustion drains (on the basis of 12 measurement sessions of 12 hours for each drain) + applying representative extrapolations of such sets of measurements valid for each one of 66 drains for 24 hour per day of the 365-day period encompassed by year 2007 indeed represent a deemed representative, reasonable and acceptable determination approach. The EPIC validation team also reviewed the specifications and function of applied measurement equipment. In summary, applied measurement procedures and related calculations were confirmed by EPIC to be deemed representative and appropriate. This CL is thus closed.

Table 2. CAR from this validation

CAR ID	1	**Section no.**	D.2	**Date:** 20/02/2018
Description of CAR				
The applied versions of the methodological tools “Tool to calculate the emission factor for an electricity system” and “Combined tool to identify the baseline scenario and demonstrate additionality” do not correspond to the latest versions of such tools.				
Project participant response				**Date:** 07/03/2018
As a response to the raised CAR, the PDD was revised by making references and applying to the latest versions of the methodological tools “Tool to calculate the emission factor for an electricity system” and “Combined tool to identify the baseline scenario and demonstrate additionality”.				
Documentation provided by project participant				
DOE assessment				**Date:** 08/03/2018
As confirmed by the EPIC assessment team, related performed corrections in the updated PDD sufficiently address the raised CAR. This CAR is thus closed.				

Table 3. CAR from this validation

CAR ID	2	**Section no.**	D.2	**Date:** 20/02/2018
Description of CAR				
The indication of GHG emissions included under the project scenario is not under conformance with ACM0001 (version 18.0).				
Project participant response				**Date:** 07/03/2018
As a response to the raised CAR, the updated PDD was revised by adding indication of GHG emissions included under the project scenario under full conformance with ACM0001 (version 18.0). Methane (CH_4) emissions due to flaring of LFG under the project scenario were added emission source. A disclaimer highlighting that CH_4 emissions from flaring (under the project scenario) are addressed as part of the determination of baseline emissions (as established by ACM0001 (version 18.0)) was also added for sake of completeness and transparency.				
Documentation provided by project participant				
DOE assessment				**Date:** 08/03/2018
As confirmed by the EPIC assessment team, related performed corrections in the updated PDD sufficiently address the raised CAR. This CAR is thus closed.				

Table 4. CAR from this validation

CAR ID	3	**Section no.**	D.2	**Date:** 20/02/2018
Description of CAR				
The updated PDD does not include sufficient details about the main characteristics and specifications of the installed backup captive off-grid electricity generator (fuelled by diesel).				
Project participant response				**Date:** 07/03/2018

As a response to the raised CAR, the updated PDD was revised by adding indication of main characteristics and specifications of the installed backup captive off-grid electricity generator (fuelled by diesel).
Documentation provided by project participant
DOE assessment **Date:** 08/03/2018
As confirmed by the EPIC assessment team, related performed corrections in the updated PDD sufficiently address the raised CAR. This CAR is thus closed.

Table 5. CAR from this validation

CAR ID	4	**Section no.**	D.3	**Date:** 20/02/2018
Description of CAR				
In the context of the assessment of the determination of the baseline scenario (in order to demonstrate the continuation of earlier identified baseline scenario), the definition of the of the alternative scenarios to the CDM project activity (as part of the application of Step 1a of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0)) is not under conformance with ACM0001 (version 18.0).				
Project participant response				**Date:** 07/03/2018
As a response to the raised CAR, the updated PDD was revised accordingly. Step 1a of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 06.0)) is applied under full conformance with ACM0001 (version 18.0). Alternatives scenarios LFG1, LFG2, LFG3, LFG4, LFG5 and LFG6 are analysed as required by ACM0001 (version 18.0).				
Documentation provided by project participant				
DOE assessment				**Date:** 08/03/2018
As confirmed by the EPIC assessment team, related performed corrections in the updated PDD sufficiently address the raised CAR. This CAR is thus closed.				

Table 6. CAR from this validation

CAR ID	5	**Section no.**	D.4	**Date:** 04/05/2018
Description of CAR				
The value for the calculation parameter "Amount of methane in the LFG generated in the SWDS in the year prior to the implementation of the project activity" ($F_{CH4,x-1}$) as valid for year 2007 and directly applied for the determination of the calculation parameter "Historical amount of methane in the LFG which is captured and destroyed" ($F_{CH4,hist,y}$) is not consistent with value of methane generation for this particular year 2007 as indicated in the sheet "FOD Calculations" of the provided emission reduction calculation spreadsheet.				
Project participant response				**Date:** 07/05/2018
As a response to the raised CAR, selected value for the calculation parameter "Amount of methane in the LFG generated in the SWDS in the year prior to the implementation of the project activity" ($F_{CH4,x-1}$) (as valid for year 2007) was correct. Related calculations for the parameter "Historical amount of methane in the LFG which is captured and destroyed" ($F_{CH4,hist,y}$) were also corrected accordingly.				
Documentation provided by project participant				
DOE assessment				**Date:** 14/05/2018
As confirmed by the EPIC assessment team, related performed corrections in both the emission reduction calculation spreadsheet and updated PDD sufficiently address the raised CAR. This CAR is thus closed.				

Table 7. CAR from this validation

CAR ID	6	**Section no.**	D.4	**Date:** 04/05/2018
Description of CAR				
Formula applied in the emission reduction calculating spreadsheet for ex-ante estimates of annual values for baseline emissions of methane (BE_{CH4}) is incorrect.				
Project participant response				**Date:** 07/05/2018

As a response to the raised CAR, formula applied for ex-ante estimates of annual values for baseline emissions of methane (BE_{CH4}) was corrected with related annual figures being corrected accordingly.
Documentation provided by project participant
DOE assessment **Date:** 08/03/2018
As confirmed by the EPIC assessment team, related performed corrections in the emission reduction calculation spreadsheet and updated PDD sufficiently address the raised CAR. This CAR is thus closed.

Table 8. FAR from this validation

FAR ID	XX	**Section no.**		**Date:** DD/MM/YYYY
Description of FAR				
No FARs were raised during this assessment.				
Project participant response				**Date:** DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				**Date:** DD/MM/YYYY

Appendix 5: Assessment of applicability conditions of the applied methodology

While details and explanations about how the applicability criteria/requirements of ACM0001 (version 18.0) /5/ + applicable methodological tools /10/ /11/ /14/ /12/ /13/ /31/ /32/ are appropriately and sufficiently included in Section B.2 of the updated PDD (version 7.0, dated 07/05/2018) /2/, related assessment details are summarized in the table below:

Applicability criteria of ACM0001 (version 18.0)	Assessment by the EPIC validation team
"*The methodology is applicable under the following conditions:* *(a) Install a new LFG capture system in a new or existing SWDS [4] where no LFG capture system was installed prior to the implementation of the project activity; or* *(b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that:* *(i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and* *(ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available.* *(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:* *(i) Generating electricity;* *(ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or* *(iii) Supplying the LFG to*	As per the CDM Project Standard for Project Activities (CDM-PS-PA), in the context of the renewal of crediting period for a previously registered CDM project activity, the PDD valid for the new 2nd 7-year crediting period should be completed by applying the latest version for the CDM baseline and monitoring methodology which was previously applied or, if applicable, the latest version for the CDM baseline and monitoring methodology of which the previously applied CDM methodology was replaced by and/or consolidated into. The project activity was previously registered as a CDM project activity by applying the CDM baseline and monitoring methodology ACM0001 (version 5) /27/. While ACM0001 (version 18.0) /5/ is the latest valid version of the ACM0001 baseline and monitoring methodology, it is thus the one to be applied in the context of the renewal of crediting period for the registered CDM project activity. Applicability criteria (b – i) is fulfilled, as the project design considered for the purpose of renewal of the crediting period encompasses the installation of an active (forced) LFG capture system in an existing landfill replacing a previously existent rudimentary passive LFG collection system (using previously existent conventional passive LFG venting and combustion drains in which LFG was sporadically combusted). Applicability criteria (b – ii) is not applicable for the project activity since there was no active LFG capture system installed in the pre-project scenario. Condition (c) is also fulfilled as the project activity design encompasses only collection and flaring of collected LFG. No utilization of LFG as fuel for electricity generation, heat generation (boiler, air heater or kiln) or glass melting furnace; and/or being supplied to consumers through a natural gas distribution network or by trucks is encompassed by the project design under the configuration valid for the renewal of its crediting period. Condition (d) is also applicable as there have been no expected changes in the operation of the Tijuquinhas landfill as a result of the implementation of the project activity and no change is expected to occur in the future either. No change in the current practice of landfilling of MSW at the Tijuquinhas landfill occurred after the implementation of the project activity either. With or without the project activity, no recycling of the organic

[4] SWDS = Solid Waste Disposal Site. In the particular case of the project activity, the considered SWDS is the Tijuquinhas landfill.

consumers through a natural gas distribution network. *(iv) Supplying compressed/liquefied LFG to consumers using trucks;* *(v) Supplying the LFG to consumers through a dedicated pipeline;* *(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity."*	fraction of the waste, neither aerobic treatment, neither incineration has occurred or is expected to occur at the Tijuquinhas landfill. In fact, recycling of organic matter, aerobic treatment and incineration has not ever been common practice in Brazil and in the region of influence of the Tijuquinhas landfill either. As part of validation assessment, in order to confirm the applicability of the selected CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ + applicable methodological tools, /5/, interviews were conducted with representatives of the project participant Proactiva Meio Ambiente – Brasil and it was confirmed that operation of the Tijuquinhas landfill site is not expected to be changed under any aspect. By taking into account the content/rationale for the applicability condition (d), and based on assessment of (i) detailed information made available in the updated PDD /2/ regarding how the condition (d) is met + (ii) assessment of credible documented information/evidences, thus sufficiently justifying the plausibility and correctness of information made available in the updated PDD /2/); the validation team is of the opinion that it is sufficiently justified the implementation and operation of the project activity has never represented and it is not expected to represent any driver or incentive to promote any kind of reduction in the amount of organic waste that would be recycled in the absence of the project activity (baseline scenario) at the Tijuquinhas landfill and/or at any other existent or potential (hypothetical) waste treatment or utilization facility under the area of influence of this particular landfill. The prevailing waste management practices pertinent to organic solid waste recycling in the region attended by the Tijuquinhas landfill were also assessed by the EPIC validation team. As verified, detailed information (including aspects, facts and statistics related to recycling of organic fraction of MSW in the region of influence of the Tijuquinhas landfill and in other regions of Brazil) are included in the related documented evidences assessed by the EPIC validation team /24/ /26/ /31/ /33/ which are appropriately referred in the updated PDD /2/. Such data sources confirm the non-existence of any facility with relevant scale/size to promoting utilization or recycling of organic fraction of solid waste (such as a solid waste composting plant) in the region of the project site. The EPIC validation team also assessed the amount of organic waste currently being recycled or utilized in the region and whether such amount has ever been potentially negatively impacted by the previous implementation of the project activity. Available and credible statistical data and information sources were assessed by the EPIC validation team (including both related sources indicated in the updated PDD /2/ evidences as well as other credible sources selected by the validation team /24/ /24/ /25/ /31/ /33/). Assessed data and information sufficiently confirm the suitability and plausibility of all related argumentation and explanations which are made available in the updated PDD /2/. Furthermore, based on assessment of related construction and design documentation for the Tijuquinhas landfill and also based on interviews performed with the PP, the EPIC validation team was also able to confirm that no initiative involving recycling of organic fraction of MSW (or any other type of solid waste) is currently expected to be implemented at the Tijuquinhas landfill or in any other site by the PP.

	Furthermore, by also taking into account the applicable regulatory framework and typical business environment for waste management services (as a public service) in Brazil, it is also the understanding and opinion of the EPIC validation team (based on its sectoral expertise and performed assessment of related sectoral literature /24/ /26/ /31/ /33/), that the starting of operation of the project activity in year 2008 has not represented and it is not expected to represent any potential incentive and/or driver for any administration of municipalities in the region, for any other public entity or for any other relevant recycling practitioner (if existent in the future) to promoting eventual changes in existent regional policies, rules and practices involving recycling of organic waste in the region. The publication "Panorama dos Resíduos Sólidos no Brasil – 2014" /26/ (Outlook of Solid Waste Sector in Brazil – 2014 states the following: "*solid waste recycling initiatives in Brazil are quite limited and encompass mostly aluminium, paper, plastic (including PET bottles) and glass material. In case of existing recycling activities, material to be recycled is separated from waste stream prior to being disposed in a landfill or dumpsite. For the specific case of recycling of organic waste material, paper waste sent to disposal in landfills is not even regarded as recyclable material (and thus not even accounted in the available statistics for recyclable material). Only clean (not contaminated) and previously separated paper waste material is considered as recyclable material. No other type of organic material has been recycled in Brazil*". In the particular case of the landfill where the project activity is implemented, no received organic waste stream has ever been directed to recycling. Thus, the project activity has never promoted any volume or practice changes in terms of recycling of organic solid waste. The "Panorama dos Resíduos Sólidos no Brasil – 2014" /26/ is a publication published by the "Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais – ABRELPE" (Brazilian Association for Municipal Solid Waste and Special Waste) and represents the most credible outlook and statistics source for the solid waste management sector in Brazil. The EPIC validation team judges that this source of information is a reliable and also realistic evidence that the management of the Tijuquinhas landfill has never changed after the project activity implementation and no change is expected to occur in the future either. As a conclusion, it is sufficiently demonstrated that under no circumstance the implementation and expected continuous operation of project activity would per se represent a driver or incentive to have any party reducing or preventing the volume of organic waste stream that would be recycled in the baseline scenario (e.g. in order to get such solid waste stream being disposed using landfilling practices at the Tijuquinhas landfill (or at any other solid waste disposal site (SWDS))). In summary, it is sufficiently demonstrated in the updated PDD /2/ that condition (d) of the above-quoted applicability criteria is sufficiently met.
"*The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is*	Applicability condition (a) is fulfilled since, as confirmed by the EPIC validation team, the baseline scenario is confirmed to be directly identified as the release (free emission) of generated LFG into the atmosphere (with a very small share of LFG being sporadically combusted in conventional LFG venting/combustion

(a) Atmospheric release of LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and *(b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln;* *(i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and* *(ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary* *(c) In the case of LFG supplied to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline, the baseline scenario is assumed to be displacement of natural gas."*	drains. As the project design does not encompass the utilization of collected LFG as fuel for electricity generation, condition (b - i) is thus not an applicable alternative. Although, while no on-site heat requirements at the Tijuquinhas landfill are identified in the description of the project design, the project design does not encompass generation of heat using LFG as fuel. Supply LFG for heat generation off-site is not considered either. Therefore, applicability condition (b - ii) is not an applicable alternative either. Applicability condition (c) is not applicable either, since the project design does not encompass supply of LFG to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline.
Non applicability condition: *This methodology is not applicable:* *(a) In combination with other approved methodologies. For instance, ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace;* *(b) If the management of the SWDS in the project activity is deliberately changed during the crediting in order to increase methane generation compared to the situation prior to the implementation of the project activity.*	Condition (a) is not applicable as LFG captured by the project activity is not expected to displace fossil fuels in a kiln, air heater or glass melting furnace. Moreover no baseline and monitoring methodology other than ACM0001 (version 18.0) /5/ is applied. Condition (b) is not applicable either as no quantitative or qualitative changes in the operation of the Tijuquinhas landfill has so far occurred and/or are expected to occur as a direct or indirect result of the implementation and operation of the project activity. As appropriately outlined in the updated PDD /2/, with or without the implementation of the project activity, no recycling of the organic fraction of the waste, aerobic waste treatment or waste incineration are expected to occur. In fact, recycling of waste, waste aerobic treatment and waste incineration are not common practices in Brazil. During the performed validation assessment, interviews were conducted with representatives of the project participant and it was confirmed that the project participant Proactiva Meio Ambiente – Brasil does not intend or plan to change the operation or design of the Tijuquinhas landfill site under any aspect. Moreover, as claimed by the project participant Proactiva Meio Ambiente – Brasil and described in the updated PDD /2/, the operational conditions and the previously conceived design of the Tijuquinhas landfill are not expected to change in the future. It is important to note that as per monitoring requirements for the monitoring parameter Management of the SWDS, 2nd 7-year crediting period, the design and operational conditions of the

	solid waste disposal site (SWDS) will be annually monitored on the basis of different sources, including inter alia: - Original construction and operational design of the Tijuquinhas landfill; - Technical specifications and requirements for the management of the Tijuquinhas landfill; - Applicable local or national regulations dealing with management and operation of existing landfills. As required by ACM0001 (version 18.0) /5/, any occurred or planned relevant change in terms of management of the landfill is to be reported and justified as part of the monitoring process for the project activity.
"The applicability conditions included in the tools referred to above also apply."	As confirmed by the EPIC validation team, demonstration of how applicability conditions for the following methodological tools to which the selected methodology /5/ refers to (and that are applied by the project activity) are met is sufficiently demonstrated in Section B.2 of the updated PDD /2/: - "Project emissions from flaring" (version 02.0.0) /10/ - "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ - "Emissions from solid waste disposal sites" (version 08.0) /14/ - "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ - "Tool to calculate the emission factor for an electricity system" (version 05.0) /13/ - "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period for renewal of crediting period" /32/

Appendix 6: Assessment of GHG emission reduction calculations

As a result of the deemed acceptable and reasonable decision of the project participant Proactiva Meio Ambiente – Brasil of applying ACM0001 (version 18.0) /5/ + applied new methodological tools /10/ /11/ /12/ /13/ for compiling the updated version of the PDD /2/, the appointed validation team confirmed, as part of the performed validation assessment, the appropriateness and correctness of the applied algorithms/formulae for the ex-post determination of emission reduction to be achieved by the project activity along its 2nd 7-year crediting period as per requirements of such CDM methodology and methodological tools.

It is important to note that the applied methodological and monitoring approach for the determination of baseline emissions for the project activity as per the updated PDD /2/ is quite different than the one previously applied as per the PDD valid for the currently expired 1st 7-year crediting period /3/ .

While as per ACM0001 (version 18.0) /5/, no leakage emissions are required to be accounted, GHG emissions reductions (ER_y) to be achieved by the project activity during the 2nd 7-year crediting period are thus correctly defined (in tCO_2e) as the difference between baseline emissions (BE_y) and project emissions (PE_y), where assessment details for the approaches for the determination of BE_y and PE_y are included below:

Assessment of the determination of baseline emissions:
As established by selected CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/ + applicable methodological tools /10/ /11/ /12/ /13/ and correctly outlined in Section B.6.1 of the updated PDD /2/, in the particular case of the project activity (under the configuration valid for its renewal of crediting period), baseline emissions are directly and correctly determined as follows:

$$BE_y = BE_{CH4,y}$$

Where:

BE_y	Baseline emissions in year *y* (in tCO_2e/yr)
$BE_{CH4,y}$	Baseline emissions of methane from the SWDS in year *y* (in tCO_2e/yr)

The determination of baseline emissions correctly applies the stepwise procedure which is established by ACM0001 (version 18.0) /5/ as follows:

Baseline emissions of methane from the SWDS ($BE_{CH4,y}$):
Baseline emissions of methane from the Tijuquinhas landfill ($BE_{CH4,y}$) are correctly determined based on the amount of methane that is captured in the project scenario and the amount of methane that is assumed as being captured and destroyed in the baseline scenario (absence of the project activity).
In addition, the effect of methane oxidation in the top layer section of the landfill in the baseline scenario (absent in the project) is also correctly taken into account as required by ACM0001 (version 18.0) /5/.
$BE_{CH4,y}$ is thus calculated (in tCO_2e/year) as follows:

$$BE_{CH4,y} = ((1 - OX_{top\_layer}) * F_{CH4,PJ,y} - F_{CH4,BL,y})) * GWP_{CH4}$$

Where:

OX_{top_layer} Fraction of methane in the LFG that would be oxidized in the top layer of the considered SWDS in the baseline (dimensionless). As correctly outlined in Section B.6.2 of the updated PDD /2/, OX_{top_layer} is correctly *ex-ante* determined as 10% (default values as per ACM0001 (version 18.0) /5/).

$F_{CH4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (in tCH_4/yr). $F_{CH4,PJ,y}$ is determined by following the stepwise approach of ACM0001 (version 18.0) /5/ as assessed below under the sub-section *"Ex post determination of $F_{CH4,PJ,y}$"*:

$F_{CH4,BL,y}$ Amount of methane in the LFG that would be flared in the baseline in year *y* (in tCH_4/yr). $F_{CH4,BL,y}$ is also determined by following the stepwise approach of ACM0001 (version 18.0) /5/ as assessed below under the sub-section "*Determination of $F_{CH4,BL,y}$*":

GWP_{CH4} Global Warming Potential of CH_4. GWP_{CH4} is correctly ex-ante determined as 25 tCO_2e/tCH_4.

Ex post determination of $F_{CH4,PJ,y}$:
During the 2nd 7-year renewable crediting period, $F_{CH4,PJ,y}$ will be ex-post determined (in tCH_4/year) as the quantity of methane flared as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y}$$

Where:

$F_{CH4,flared,y}$ Amount of methane in the LFG which is destroyed by flaring in year *y* (in tCH_4/yr). For each one of the flares, $F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare and any methane emissions from the flare, as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - (PE_{flare,y} / GWP_{CH4})$$

Where:

$F_{CH4,sent\_flare,y}$ Amount of methane in the LFG which is sent to the flare in year *y* (in tCH_4/yr)

$PE_{flare,y}$ Project emissions from flaring of the residual gas stream in year *y* (in tCO_2e/yr)

Determination of $F_{CH4,sent\_flare,y}$:
As established by ACM0001 (version 18.0) /5/ and as correctly outlined in the updated PDD /2/, $F_{CH4,sent\_flare,y}$ is correctly determined by following applicable guidance of the "Tool to determine the mass flow of greenhouse gas in a gaseous stream" (version 03.0) /12/.
In the context of the application of such methodological tool for the ex-post determination of $F_{CH4,sent\_flare,y}$ the following set requirements are correctly regarded as applicable:

- The gaseous stream the tool shall be applied to is the LFG stream delivery pipeline to the high temperature enclosed flares. $F_{CH4,sent\_flare,y}$ is thus calculated as the mass flow of methane to the flare.
- CH_4 is the greenhouse gas for which the mass flow should be determined;
- The flow of the gaseous stream should be measured on continuous basis;

- The simplification offered for calculating the molecular mass of the gaseous stream is valid (applicable equations in the methodological tool);

The mass flow should be calculated on an hourly basis for each hour *h* in year *y*;
As confirmed by the EPIC validation team applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ was correctly applied to determine $F_{CH4,sent\_flare,y}$ as assessed below:

Use of applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" for determining $F_{CH4,sent\_flare,y}$:
As confirmed by the EPIC validation team, applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ is correctly applied for the ex-post determination of $F_{CH4,sent\_flare,y}$ as follows:

Use of Option A, B, C or D:
The following potential measurement options of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/ are considered for the determination of $F_{CH4,sent\_flare,y}$:

Considered methodological approaches for the determination of $F_{CH4,sent\_flare,y}$ as per the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /12/

Option	Flow of gaseous stream	Volumetric fraction
A	Volume flow – dry basis	Dry or wet basis
B	Volume flow – wet basis	Dry basis
C	Volume flow – wet basis	Wet basis
D	Mass flow – dry basis	Dry or wet basis

As correctly outlined in the updated PDD /2/, depending on project conditions and installed instruments/equipment along the 2nd 7-year crediting period, Option A, B, C or D will be selected *ex-post*. The decision of the project participant Proactiva Meio Ambiente – Brasil to select the calculation option *ex-post* (as reflected in the updated PDD /2/) is deemed reasonable and acceptable (by taking into account that the selection of Option A, B, C or D clearly depends on project's operational aspects/conditions and specifications of monitoring equipment operating along the 2nd crediting period).

Thus, along the 2nd crediting period, depending on project's operational aspects/conditions and specifications of operative monitoring equipment, either Option A, B, C or D will be applied ex-post as assessed below:

<u>*Option A*</u>

$$F_{CH4,t} = V_{t,db,j} * v_{CH4,t,db} * \rho_{CH4,t}$$

Where:

$F_{CH4,t}$ Mass flow of greenhouse gas *i* (*i* = CH_4) in the gaseous stream (LFG) in time interval *t* (in kg gas/h)

$V_{t,db,j}$ Volumetric flow of LFG stream in time interval *t* on a dry basis for *j*

$v_{CH4,t,db}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a dry basis (in m^3 gas *i*/m^3 dry gas)

$\rho_{CH4,t}$ Density of methane in the gaseous stream in time interval *t* (kg gas *i*/m^3 gas *i*). $\rho_{CH4,t}$ will be determined as follows:

$\rho_{CH4,t} = P_t * MM_{CH4} / R_u * T_t$

Where:

P_t Absolute pressure of the gaseous stream (LFG) in time interval *t* (in Pa)

T_t Temperature of the gaseous stream (LFG) in time interval *t* (in K)

MM_{CH4} Molecular mass of greenhouse gas *i* (*i = CH4)* (in kg/kmol)

R_u Universal ideal gases constant (in $Pa.m^3/kmol.K$)

Option B

$F_{CH4,t}$ is determined by using the equations listed above under *Option A* by converting the measured volumetric flow from wet basis to dry basis as follows:

$V_{t,db} = V_{t,wb} / (1 + v_{H2O,t,db})$

Where:

$V_{t,db}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a dry basis (in m^3 dry gas/h)

$V_{t,wb}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis (in m^3 wet gas/h)

$v_{H2O,t,db}$ Volumetric fraction of H_2O in the gaseous stream (LFG) in time interval *t* on a dry basis (in m^3 H_2O/m^3 dry gas). The volumetric fraction of H_2O in time interval *t* on a dry basis ($v_{H2O,t,db}$) is estimated as follows:

$v_{H2O,t,db} = (m_{H2O,t,db} * MM_{t,db}) / (MM_{H2O})$

Where:

$v_{H2O,t,db}$ Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis (in m^3 H_2O/m^3 dry gas)

$m_{H2O,t,db}$ Absolute humidity in the gaseous stream in time interval *t* on a dry basis (in kg H_2O/kg dry gas)

$MM_{t,db}$ Molecular mass of the gaseous stream in time interval *t* on a dry basis (kg dry gas/kmol dry gas)

MM_{H2O} Molecular mass of H_2O (in kg H_2O/kmol H_2O)

As also defined in the updated PDD /2/, in case *Option B* is selected, the absolute humidity of the gaseous stream ($m_{H2O,t,db}$) will be determined using Option 2 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ for the "*Determination of the absolute humidity of the gaseous stream"* as follows:

Option 2: Simplified calculation without measurement of the moisture content

While this considered calculation option provides a simple and conservative approach to determine the absolute humidity (by assuming the gaseous stream is dry or saturated depending on which is the conservative situation), if it is conservative to assume that the gaseous stream is dry, then $m_{H2O,t,db}$ is appropriately assumed to equal 0. If it is conservative to assume that the gaseous stream is saturated, then $m_{H2O,t,db}$ is appropriately assumed to equal the saturation absolute humidity ($m_{H2O,t,db,sat}$) and calculated as follows:

$$m_{H2O,t,db,sat} = (p_{H2O,t,db,Sat} * MM_{H2O}) / (P_t - p_{H2O,t,Sat}) * MM_{t,db}$$

Where:

$m_{H2O,t,db,sat}$ Saturation absolute humidity in time interval *t* on a dry basis (in kg H_2O/kg dry gas)

$p_{H20,t,Sat}$ Saturation pressure of H_2O at temperature T_t in time interval *t* (in Pa)

T_t Temperature of the gaseous stream in time interval *t* (in K)

P_t Absolute pressure of the gaseous stream in time interval *t* (in Pa)

MM_{H2O} Molecular mass of H_2O (in kg H_2O/kmol H_2O)

$MM_{t,db}$ Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas) $MM_{t,db}$ is estimated using the following equation:

$$MM_{t,db} = \Sigma_i (v_{i,t,db} * MM_k)$$

Where:

$v_{k,t,db}$ Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis (m^3 gas k/m^3 dry gas)

MM_k Molecular mass of gas *k* (kg/kmol)

k All gases, except H_2O, contained in the gaseous stream (e.g. N_2, CO_2, O_2, CO, H_2, CH_4, N_2O, NO, NO_2, SO_2, SF_6 and PFCs).

In accordance with the simplification given in the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) /12/ it is appropriately indicated in the updated PDD /2/ that only the volumetric fraction of CH_4 ($v_{CH4,t,db}$) will be monitored and the difference to 100% will be considered as pure nitrogen.

Option C

$F_{CH4,t} = V_{t,wb,n} * v_{CH4,t,wb} * \rho_{CH4,n}$

Where:

$F_{CH4,t}$ Mass flow of greenhouse gas methane in the gaseous stream in time interval *t* (in kg gas/h)

$V_{t,wb,n}$ Volumetric flow of the gaseous stream (LFG) in time interval *t* on a wet basis at normal conditions (in m^3 wet gas/h)

$v_{CH4,t,wb}$ Volumetric fraction of methane in the gaseous stream (LFG) in time interval *t* on a wet basis (in m^3 gas /m^3 wet gas)

$\rho_{CH4,n}$ Density of methane in the gaseous stream at normal conditions (in kg gas *i* /m^3 wet gas *i*). Parameter $\rho_{CH4,n}$ will be determined as follows:

$\rho_{CH4,n} = P_n * MM_{CH4} / R_u * T_n$

Where:

P_n Absolute pressure at normal conditions (in Pa)

T_n Temperature at normal conditions (in K)

MM_{CH4} Molecular mass of methane (in kg/kmol)

R_u Universal ideal gases constant (in $Pa.m^3/kmol.K$)

The following equation should be used to convert the volumetric flow of the gaseous stream from actual conditions to normal conditions of temperature and pressure:

$V_{t,wb,n} = V_{t,wb,j} *(T_n / T_t) * (P_t / P_n)$

Where:

$V_{t,wb,n}$ Volumetric flow of the considered gaseous stream (LFG) in a time interval *t* on a wet basis at normal conditions (in m^3 wet gas/h)

$V_{t,wb,j}$ Volumetric flow of LFG stream in time interval *t* on a wet basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare) (in m^3 wet gas/h)

P_t Pressure of the gaseous stream in time interval *t* (in Pa)

T_t Temperature of the gaseous stream in time interval *t* (in K)

P_n Absolute pressure at normal conditions (in Pa)

T_n Temperature at normal conditions (in K)

Option D

The mass flow of methane $F_{i,t}$ (i = CH_4) is determined using equations 12 and 13 as outlined in the updated PDD [/2/]. The volumetric flow of the LFG in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare ($V_{t,db,j}$) is determined by converting the mass flow of the gaseous stream to a volumetric flow as follows:

$$V_{t,db,j} = M_{t,db,j} / \rho_{t,db}$$

Where:

$V_{t,db,j}$ Volumetric flow of LFG stream in time interval *t* on a dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare) (in m^3 dry gas/h)

$M_{t,db,j}$ Mass flow of the LFG stream in time interval *t* on dry basis for *j* (where *j* is the LFG delivery pipeline to each item of electricity generation and LFG delivery pipeline to the flare) (in kg/h)

$\rho_{t,db}$ Density of gaseous stream (LFG) in time interval *t* on a dry basis (in kg dry gas / m^3 dry gas). $\rho_{t,db}$ shall be determined as follows:

$$\rho_{t,db} = P_t * MM_{t,db} / R_u * T_t$$

Where:

$MM_{t,db}$ Molecular mass of the gaseous stream (LFG) in a time interval t on a dry basis (in kg dry gas/kmol dry gas)

P_t Pressure of the gaseous stream (LFG) in time interval *t* (in Pa)

T_t Temperature of the gaseous stream (LFG) in time interval *t* (in K)

Determination of $PE_{flare,y}$ (in the context of the determination of $F_{CH4,flared,y}$):

As correctly outlined in the updated PDD [/2/], $PE_{flare,y}$ is determined using the methodological approaches of the latest version of the methodological tool "Project emissions from flaring" (version 02.0) [/10/]. Project emissions from flaring the residual gas ($PE_{flare,y}$) are determined based the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH4,RG,m}$). As correctly described in the updated PDD [/2/], the 3-step approach for determining project emissions from flaring through continuous monitoring of following parameters will be used as per the applicable guidance of the tool "Project emissions from flaring" [/10/]. The application of this methodological tool encompasses the following steps:

STEP 1: Determination of the methane mass flow of the residual gas

This first step indicates that the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" [/12/] is used to determine the mass flow of methane in the residual gaseous stream in minute *m* ($F_{CH4,m}$). Furthermore, $F_{CH4,m}$ shall be used to determine the mass of methane in kilograms fed to the flare in minute *m* ($F_{CH4,RG,m}$).

1. The following requirements are correctly considered:
2. The gaseous stream tool shall be applied to the residual gas;
3. The flow of the gaseous stream shall be measured continuously;
4. CH_4 is the greenhouse gas *i* for which the mass flow should be determined;
5. The simplification offered for calculating the molecular mass of the gaseous stream is

valid (equations 3 and 17 in the tool); and

6. The time interval *t* for which mass flow should be calculated is every minute *m*.

STEP 2: Determination of the flare efficiency

Option A: Application of default value:
The flare efficiency for each minute *m* ($\eta_{flare,m}$) is 90% when the following two operational conditions/requirements are simultaneously met (in order to demonstrate that the flare is operating as per the recommendations and requirements set by the equipment manufacturer for the minute *m* in question):

(1) The temperature of the exhaust gases of the flare (monitoring parameter $T_{EG.m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{RG,m}$) is within the manufacturer's specification/requirements for the flare (monitoring parameter $SPEC_{flare}$) in minute *m*;

(2) Flame is detected in the flare in minute *m* (monitoring parameter $Flame_m$).

If for the minute *m*, conditions (1) and/or (2) are not met, $\eta_{flare,m}$ is set as 0% for the minute in question

Option B: Measured flare efficiency:
The flare efficiency in the minute *m* is determined as a value which is calculated based on performed related measurements ($\eta_{flare,m} = \eta_{flare,calc,m}$) when the following conditions are simultaneously met (in order to demonstrate that the flare is operating):

(1) The temperature of the exhaust gas of the flare (monitoring parameter $T_{EG.m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute *m*;

(2) Flame is detected in the flare in minute *m* (monitoring parameter $Flame_m$).

Otherwise $\eta_{flare,m}$ is set as 0%.

Option B.1: Measured flare efficiency:

The efficiency of combustion in the flare in minute m is determined as the average of two measurements of the flare efficiency made in year y ($\eta flare,calc,y$), based on monitored data as per Option B.1: Biannual measurement of the flare efficiency, as follows:

$$\eta_{flare,calc,y} = 1 - \tfrac{1}{2} \sum (F_{CH4,EG,t} / F_{CH4,RG,t})$$

Where:

$\eta_{flare,calc,y}$	Flare efficiency in the year *y*
$F_{CH4,RG,t}$	Mass flow of methane in the residual gas on a dry basis at reference conditions in the time period *t* (in kg)
t	The two time periods in year y during which the flare efficiency is measured, each a minimum of one hour and separated by at least six months
$F_{CH4,EG,t}$	Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t* (in kg). $F_{CH4,EG,t}$ is to be measured according to an

appropriate national or international standard. $F_{CH4,RG,t}$ is calculated according to Step 1 and consists of the sum of methane flow in the minutes m that make up the time period t. As an alternative to this approach, default values may be applied (in case determining of the methane destruction efficiency of the flare (flare efficiency - $\eta_{flare,m}$) is not available) as per Option A: Default value.

As assessed by the EPIC validation team, the application of Option B.1 of the methodological tool "Project emissions from flaring" (version 02.0) /10/ is correctly outlined in the updated PDD /2/.

Ex ante determination of $F_{CH4,PJ,y}$:

As established by ACM0001 (version 18.0) /5/, the *ex-ante* estimation of emission reductions for the whole 2nd 7-year renewable crediting period are correctly calculated and correctly reported in the updated PDD /2/ based on the application of the multi-phased first order decay (FOD) model as per applicable guidance of the "Emissions from solid waste disposal sites" /14/. In accordance to ACM0001 (version 18.0) /5/, in the particular context of the *ex-ante* estimations of emission reductions to be achieved by the project activity, $F_{CH4,PJ,y}$ is determined (in tCO_2e) as follows:

$$F_{CH4,PJ,y} = \eta_{PJ} * BE_{CH4,SWDS,y} / GWP_{CH4}$$

Where:

$F_{CH4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year *y* (in tCH_4/yr)

$BE_{CH4,SWDS,y}$ Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (in tCO_2e/yr). $BE_{CH4,SWDS,y}$ was determined using the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/. Application A "The CDM project activity mitigates methane emissions from a specific existing SWDS" is selected. The calculation of values for $BE_{CH4,SWDS,y}$ correctly takes into account the different types of waste *j* with respectively different decay rates k_j and different fractions of degradable organic carbon (DOC_j). By correctly applying the multi-phased FOD model, in the context of the *ex-ante* estimation of emission reduction, baseline emissions of methane are calculated based on the actual and projected waste streams $W_{j,x}$ disposed in each year *x.*

η_{PJ} Efficiency of the LFG capture system that will be installed in the project activity. η_{PJ} is correctly *ex-ante* determined as 0.70 (70%).

Determination of $F_{CH4,BL,y}$:

As required by the selected methodology /5/, the amount of methane assumed as being captured and destroyed in the baseline scenario ($F_{CH4,BL,y}$) (absence of the project activity) due to eventually applicable regulatory or contractual requirements, or to address eventually existent applicable safety and other concerns (which are collectively referred to as "*requirement"* under this step) is correctly determined by following the applicable approach through selection of one of the four cases of the applied CDM baseline and monitoring methodology as outlined in the table below:

Cases for the determination of $F_{CH4,BL,y}$ as per ACM0001 (version 18.0):

Situation at the start of the project activity	Requirement to destroy methane?	Existing LFG capture and destruction system?
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

Source: ACM0001 (version 18.0) /5/

Assessment of the existence of regulatory or contractual and non-regulatory or non-contractual requirements to destroy methane (as per the applicable definition of "requirement" of ACM0001 (version 18.0):

Existence of contractual requirements related to LFG management for the particular case of the project activity:
As confirmed by the EPIC validation team, from the time the Tijuquinhas landfill was designed and built until nowadays there has been no legal municipal, state or national legally binding requirement and/or regulation establishing any management requirement and/or mandate for LFG management for this particular landfill site. The following disclaimer is thus confirmed to be appropriately added in the updated PDD /2/:

"Requirement to destroy methane: NO".

By taking this assumption into account, Case 2 and Case 4 (*Requirement to destroy methane? = Yes*) from the cases above-summarized are thus directly regarded as not applicable cases for the determination of $F_{CH4,BL,y}$. This is deemed reasonable and correct.

Thus, in the context of the assessment of the valid cases, the remaining possibly valid alternatives (cases) (after the confirmation of existence of non-regulatory and non-contractual requirements to destroy methane due to safety and odor concerns) are thus Case 1 and Case 3 (*Requirement to destroy methane? = No*).

Assessment of existence of "LFG capture and destruction system" at the Tijuquinhas landfill (as per the applicable definition of "existing LFG capture and destruction" of ACM0001 (version 18.0)):

The EPIC validation team verified that, as appropriately outlined in Section A.3, until the 2nd half of year 2008 (prior of the project activity starting of operation), despite of the non-existence of requirements to destroy methane at the Tijuquinhas landfill, this landfill has been under regular operation with LFG being sporadically combusted in permanently available reduced number of conventional passive LFG venting/combustion drains available at that time. As also assessed by the EPIC validation team, while historical data on the status and amount of LFG collected and combusted by such pre-project previously existent set of conventional passive LFG venting/combustion drains are available for year 2007 (last calendar year prior to the implementation of the project activity). As assessed by the EPIC validation team, historical data records on the status of such set of drains in terms of combustion of LFG (as an outcome of a campaing organized and performed by Proactiva Meio Ambiente - Brasil in year 2006) + historical data records of measurements of the amount of methane collected and combusted in such pre-project previously existent conventional passive LFG venting/combustion drains (as an outcome of a campaing organized and performed by Proactiva Ambiental - Brasil in year 2007) are available. As outlined in the updated PDD /2/ and informed to the EPIC validation team by the representatives of the project participant Proactiva Meio Ambiente - Brasil, the campaign for the status of passive LFG venting/combustion drain held in year 2006 and the campaing for methane measurements in such drains held 2007 allowed better understanding the role of LFG generation within the geotechniques (physical stability) of the Tijuquinhas landfill at that

time and somehow also served as an input for the design of the project's LFG collection and flaring system.The EPIC validation team thus confirms that, there was an existing LFG capture system at the Tijuquinhas landfill prior to the implementation of the project activity. Therefore, Case 3 is correctly regarded as applicable, with Case 1 being also regarded as not applicable.

In summary, the only option/case applicable for the Tijuquinhas landfill (in the absence of the project activity) is correctly selected as Case 3.

Application of methodological guidance valid for Case 3:

As per applicable guidance of ACM0001 (version 18.0) /5/, $F_{CH4,Bl,y}$ is correctly calculated as:

$F_{CH4,BL,y} = F_{CH4,BL,sys,y}$

As also confirmed by the EPIC validation team, the amount of methane captured through the use of the pre-project LFG management infrastructure cannot be monitored ex-post since such previously existent infrastructure (under the configuration during the period from year 2007 to the start of operation of the project activity) is not any longer available. As informed to the EPIC validation team, such pre-project LFG management infrastructure was decommissioned and disassembled as a result of the beginning of operations of the project activity in the 2nd half of year 2008.

Thus, in the particular case of Tijuquinhas landfill, $F_{CH4,BL,y}$ is thus correctly determined as follows:

$F_{CH4,BL,y} = F_{CH4,BL,x-1} / F_{CH4,x-1} * F_{CH4,PJ,y}$

Where:

$F_{CH4,BL,x-1}$ Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity. As per previously available measurement records valid for year 2007, $F_{CH4,BL,x-1}$ is calculated as 484.00 tCH_4. While $F_{CH4,BL,x-1}$ represents a ex-ante selected (fixed) parameter, details for this parameter are also correctly summarized in Section B.6.2 of the updated PDD /2/. As verified by the EPIC validation team, calculated value represents the outcome of a measurement campaing that was organized and performed by the project participant and project owner Proactiva Meio Ambiente – Brasil within year 2007 (with support of LFG experts contracted for the task). Performed measurements were fully based on campaing encompassing the undertaking of 12 sessions of systematic measurements of flow and CH_4 content in LFG directly emitted from the 66 pre-project passive LFG venting/combustion drains existent at the Tijuquinhas landfill prior of the implementation of the project activity (with 12 hours of duration for each individual measurements session). As indicated in a sheet summarizing related measurements and calculations /38/, a set of 4 inspection wellheads (specifically developed for installation on LFG extraction system with vertical LFG venting/combustion drains) were alternately positioned in the existent 66 passive LFG venting/combustion drains along year 2007 for performing related measurments. While the utilized set of inspection wellheads incorporate a built-in gas flow measurement device (a modified pitot tube), gas temperature port, quick-connect gas sample and pressure ports, flow control gate valve and flex-hose; portable CH4/CO2/O2 gas analyzer units were jointly used with the such measuring wellheads during the measuring sessions, with measurement data of CH4 content in collected LFG + LFG flow in the 66 drains being recorded in such CH4/CO2/O2 gas analyzer units. By taking into consideration the results of

the set of LFG flow and CH4 content measurements encompassed by the campaign in each one of the 66 pre-project passive LFG venting/combustion drains (12 sessions encompassing 12 hours each) and also by applying representative extrapolations of set of measurement sessions for 24 hour per day of the 365-day period encompassed by year 2007, the total amount of methane in the LFG which is captured and destroyed in this particular year (year prior to the implementation of the project activity) was determined. Summary of measurments and calculations are included in the compiled sheet summarizing related measurements and calculations /38/ which was made available to the EPIC validation team.

The EPIC validation team also reviewed technical sheets with the specifications and function of measurement indtruments/equipment applied during the measurement campaign (Accu-Flo model wellheads, wellbore seals and portable CH_4CO_2/O_2 gas analyser units manufactured by LANDTEC North America, Inc.) /39/ /40/ /41/ and was able to confirm the suitability of such instruments/equipment for performance of measurements as part of the campaign. It is EPIC opinion that deriving the value for the parameter FCH4,BL,x-1 (value for year 2007) based on the results of previously performed evaluation work encompassing systematic and representative measurement campaign of flow and CH4 content of LFG directly emitted from the 66 pre-project LFG venting/combustion drains + applying representative extrapolations of available set of measurement sessions for 24 hour per day of the 365-day period encompassed by year 2007 represent a deemed reasonable and acceptable determination approach. Applied measurement procedures and related calculations were confirmed by EPIC to be deemed representative, appropriate.

$F_{CH4,x-1}$ Amount of methane in the LFG generated in the SWDS in the year prior to the implementation of the project activity. $F_{CH4,x-1}$ is calculated as 5,753.13 tCH_4 (value valid for year 2007). As confirmed by the EPIC validation team, details about the correct determination of $F_{CH4,x-1}$ are made available in the emission reduction calculation spreadsheet /4/ valid for the 2nd 7-year crediting period (that is enclosed to the updated PDD /2/).

In summary, by taking into account the assumed/determined values for $F_{CH4,BL,x-1}$ and $F_{CH4,x-1,}$ the EPIC validation team was able to confirm that, as outlined in the updated PDD /2/, $F_{CH4,BL,y}$ is correctly determined as follows:

$F_{CH4,BL,y} = (484.00 / 5,753.13) * F_{CH4,PJ,y} = 0.0842 * F_{CH4,PJ,y}$

Determination of Project Emissions:

The only emission sources to be accounted as project emissions in year *y* (PE_y) are summarized as follows:

$PE_y = PE_{EC,y}$

Where:

$PE_{EC,y}$ Project emissions due to the consumption of electricity by the project activity.

Assessment of the determination of project emissions due to the consumption of electricity by the project activity ($PE_{EC,y}$):

In the particular case of the project activity, $PE_{EC,y}$ is determined as follows:

$PE_{EC,y} = PE_{EC,grid,y} + PE_{EC,captive,y}$

Where:

$PE_{EC,grid,y}$ Project emissions from consumption of grid electricity due to the project activity in year *y.* $PE_{EC,grid,y}$ is correctly outlined in the updated PDD /2/ as being determined (in tCO_2/yr) based on monitoring ex-post of records of amount of grid-sourced electricity that is consumed by the project activity (by following applicable guidance and monitoring requirements of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/). Ex-ante determined annual values for CO_2 emission factor for consumed grid electricity (by following applicable guidance and monitoring requirements of the "Tool to calculate the emission factor for an electricity system" (version 05.0) /13/) is also be considered. Ex-ante determined value of the Average technical transmission and distribution losses in the National Grid of Brazil in year *y* ($TDL_{grid,y}$) (by also following the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/) is also considered as per the following calculation formulae:

$PE_{EC,,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,y} * (1 + TDL_{grid,y})$

Where:

$EC_{PJ,grid,y}$ Quantity of grid-sourced electricity consumed by the project activity in year *y* (in MWh/yr). $EC_{PJ,grid,y}$ will be monitored (based on measurements) during the remaining share of the 1st 7-year renewable crediting period.

$TDL_{grid,y}$ Average technical transmission and distribution losses in the National Grid of Brazil in year *y.* $TDL_{grid,y}$ is correctly *ex-ante* determined as 20% in accordance with Scenario A (Option A1) of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/.

$EF_{EL,grid,y}$ Emission factor for grid electricity generation in year *y* (in tCO_2/MWh). The CO_2 emission factor $EF_{EL,grid,y}$ is ex-ante calculated by applying the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ and Option A.1 was correctly chosen. Due to the definition of related parameters as per the applied CDM baseline and monitoring methodology ACM0001 (version 18.0) /5/, scenario A applies as the electricity end users would be supplied with electricity sourced by the same power grid (i.e. the National Electricity Grid of Brazil) which will be the same electricity grid connected to the project activity's new electricity generation facility (using LFG as gaseous fuel). The EPIC validation team thus confirms that Option A.1 is correctly selected. In accordance applicable guidance of ACM0001 (version 18.0) /5/, the parameter $EF_{EL,k,y}$ is correctly defined as "Combined margin CO_2 emission factor" ($EF_{grid,CM,y}$).

Ex-ante determination of $EF_{grid,CM,y}$:
As outlined in the updated PDD [2], the parameter $EF_{grid,CM,y}$ is determined *ex-ante* in accordance with applicable guidance of the "Tool to calculate the emission factor for an electricity system" (version 05.0) [13]. The *simple-adjusted OM* method is appropriately selected as the calculation method. The selection of this approach is in accordance with related guidance and definitions set by the Brazilian Ministry of Science, Technology and Innovation (MCTI) [30], which holds the Comissão Interministerial da Mudança Global do Clima (CIMGC) (the DNA of Brazil).

As correctly outlined in the updated PDD [2], for the 2nd 7-year renewable crediting period, $EF_{grid,CM,y}$ is determined *ex-ante* (in tCO_2/MWh) by following the applicable stepwise procedure as per the latest version of the "Tool to calculate the emission factor for an electricity system" (version 05.0) [13], where the following formulae is applied:

$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$

Where:

$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year *y* (in tCO_2/MWh)
$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (in tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The weighting factors for build and operating margin (w_{BM} and w_{OM}) were also correctly *ex-ante* selected as per applicable guidance of the "Tool to calculate the emission factor for an electricity system" (version 05.0) [13]. $EF_{grid,OM,y}$ is calculated *ex-ante* by applying calculation guidance of the methodological tool applicable for *simple-adjusted OM* and determined value will remain fixed during the entire 2nd 7-year crediting period of the project activity. As appropriately outlined in the upated PDD [2], this calculation method represents a variation of the simple OM method, where the power plants/units (including imports) are separated in low-cost/must-run power sources (*k*) and other power sources (*m*). The simple adjusted OM is calculated based on the net electricity generation of each power unit and an emission factor for each power unit as follows:

$$EF_{grid,OM-adj,y} = \left(1-\lambda_y\right) \times \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y \times \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where:

$EF_{grid,OM-adj,y}$	Simple adjusted operating margin CO_2 emission factor in year *y* (in tCO_2/MWh)
λ_y	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y*
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *k* in year *y* (in MWh)

$EG_{k,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (in MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (in tCO_2/MWh)
$EF_{EL,k,y}$	CO_2 emission factor of power unit *k* in year *y* (in tCO_2/MWh)
m	All grid power units serving the grid in year *y* except low-cost/must-run power units
k	All low-cost/must-run grid power units serving the grid in year *y*
y	The relevant year as per the data vintage (2014, 2015 and 2016 in the particular case of the project activity).

For the determination of annual values for the Build margin CO_2 emission factor ($EF_{grid,BM,y}$) for the 2nd 7-year crediting period, the choice of the project participants is Option 1. The build margin emissions factor is the generation-weighted average emission factor (in tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (in MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (in tCO_2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

The *simple-adjusted* operating margin is correctly applied and ex-ante data vintage is selected for the calculation of $EF_{grid,OM,y}$ as being the 3-year generation-weighted average that is calculated based on data for the years of 2014, 2015 and 2016 (such years are confirmed by the EPIC validation team as being the most recent data public available at the time of completion of this PDD).
As confirmed by the EPIC validation team, the average calculated valud of $EF_{grid,OM-adj,y}$ valid for the 2nd 7-year crediting period is correctly calculated as 0.4979 tCO_2/MWh. Values of $EF_{grid,BM,y}$ are determined and reported by the DNA of Brazil.

The values for w_{OM} and w_{BM} are ex-ante selected as per applicable guidance of the "Tool to calculate the emission factor for an electric system" which is valid for 2nd crediting periods as follow:

$w_{OM} = 0.25$

$w_{BM} = 0.75$

Further details about the determination of ex-ante selected values for w_{OM} and w_{BM} are presented in Section B.6.2.

$EF_{grid,CM,y}$ is thus calculated as follows:
As confirmed by the EPIC validation team, $EF_{grid,CM,y}$ is correctly calculated as follows:

$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} = 0.25 * 0.4979 + 0.75 * 0.1581 = 0.2431\ tCO_2/MWh$

$PE_{EC,captive,y}$ Project emissions from consumption of electricity generated by the captive off-grid electricity generator fuelled by fossil fuel (diesel) in year *y.* Emissions arising from diesel consumption by the installed off-grid captive electricity generator will be monitored *ex-post* by applying approaches/options B1, B2, B3 or B4 as presented in the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/. The PDD /2/ correctly outlines that as per Options B1 and B2 of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/, $PE_{EC,captive,y}$ is calculated as follows:

$PE_{EC,captive,y} = EC_{PJ,captive,y} * EF_{EL,captive,y} * (1 + TDL_{captive,y})$

Where:

$EC_{PJ,captive,y}$ Amount of electricity sourced by the captive electricity generator (fuelled by Diesel) and consumed by the project activity in year *y*. $EC_{PJ,captive,y}$ will be measured and monitored in MWh/year.

$EF_{EL,captive,y}$ CO_2 emission factor for electricity sourced by the captive off-grid electricity generator in year y (tCO_2/MWh). By following Option B2 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/, $EF_{EL,captive,y}$ is ex-ante determined as 1.3 tCO_2/MWh. As per Option B1 of the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/, $EF_{EL,captive,y}$ is determined as follows:

$EF_{EL,captive,y} = (FC_{Diesel,y} * NCV_{Diesel,y} * EF_{CO2,Diesel,y}) / EG_{Diesel\text{-}generator,y}$

Where:

$FC_{Diesel,y}$ Quantity of fuel diesel combusted by the captive off-grid electricity generator (liters)

$NCV_{Diesel,y}$ Net calorific value of the fuel diesel (GJ/liters)

$EF_{CO2,Diesel,y}$ CO_2 emission factor of fuel diesel (in tCO_2/GJ)

$EG_{Diesel\text{-}generator,y}$ Quantity of electricity generated by captive off-grid electricity generator fuelled by diesel (in MWh). It is important to note that If all electricity generated by the captive electricity generator is consumed by the project activity, $EG_{Diesel\text{-}generator} = EC_{PJ,captive,y}$

$TDL_{captive,y}$ Average technical transmission and distribution losses for electricity sourced by the captive electricity generator in year *y*. In accordance with the applicable provisions of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of

electricity generation" (version 03.0) /11/, as a simplification, $TDL_{captive,y}$ is *ex-ante* determined as zero as correctly presented in Section B.6.2 of the revised version of the PDD /2/.

As also outlined in the revised version of the PDD /2/, if Option B3 of the methodologial tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ is selected, $PE_{EC,captive,y}$ will be calculated by determining the CO_2 emissions from all diesel combustion in the captive electricity generator as per the applicable provisions of the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 2) as follows:

$PE_{EC,captive,y} = FC_{Diesel,y} * COEF_{Diesel,y}$

Where:

$FC_{Diesel,y}$ Quantity of fuel diesel combusted by the captive off-grid electricity generator (liters)

$COEF_{Diesel,y}$ The CO_2 emission coefficient for the fuel diesel (in tCO_2/liters) which is calculated by following Option B of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" as follows:

$COEF_{Diesel,y} = NCV_{Diesel,y} * EF_{CO2,Diesel,y}$

Where:

$NCV_{Diesel,y}$ Net calorific value of the fuel diesel (in GJ/liters)

$EF_{CO2,Diesel,y}$ CO_2 emission factor of fuel diesel (in tCO_2/GJ)

Finally, as per Option B4 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/, $PE_{EC,captive,y}$ is calculated based on the rated capacity of the installed captive off-grid electricity generator and by assuming a CO_2 emission factor of 1.3 tCO_2/MWh for electricity generated by the captive off-grid electricity generator (which is assumed as being under operation for 8,760 hours per year) as follows:

$PE_{EC,captive,y} = 11{,}400\ tCO_2/MWh * PP_{CP,Diesel\text{-}generator}$

Where:

$PP_{CP,Diesel\text{-}generator}$ Rated capacity of the installed captive off-grid electricity generator (fuelled by Diesel) (in MW). As confirmed by the EPIC validation team, $PP_{CP,Diesel\text{-}generator}$ is correctly ex-ante determined as 0.113 MW)

It is important to note that, as outlined in the PDD /2/, while the captive off-grid backup electricity generator (fuelled by diesel) is expected to be used only for emergency purposes (whenever supply of grid electricity to the project activity is temporarily interrupted), there are no estimated amounts of electricity to be generated by this generator nor estimated amount of fossil fuel diesel to be consumed by the generator. Thus, consumption of electricity sourced by this backup generator is not considered in the context of ex-ante estimates of project emissions. This is demeed reasonable and acceptable.

Determination of Leakage emissions:

In accordance with ACM0001 (version 18.0) /5/, leakage emissions are not considered for the determination of emission reductions to be achieved by the project activity. As part of its assessment, the EPIC validation team confirms that, as highlighted in the updated PDD /2/, it was not identified project emission or leakage which would contribute to more than 1% of the emission reductions to be achieved by the project activity other than the ones covered by the selected CDM baseline and monitoring methodology (ACM0001 (version 18.0)) /5/.

Ex-ante estimation of emission reductions to be achieved by the project activity during the 2nd 7-year crediting period:

The *ex-ante* estimation of emission reductions to be achieved by the project activity (as calculated in the emission reductions calculation spreadsheet /4/ and summarized in the updated PDD /2/) was assessed by the EPIC validation team. The performed assessment included checking of input

parameters and formulas contained in the spreadsheet cells for estimating baseline and project emissions along the 2nd 7-year renewable crediting period. The EPIC validation team was also able to confirm that all assumptions and data used for estimating GHG emission reductions to be achieved by the project activity are correctly selected and appropriately listed in the updated PDD /2/ and in the emission reductions calculation spreadsheet /4/. Furthermore, formulas, parameters and values are found to be complete, accurate and transparent.

For the project activity baseline emissions generated from waste disposal at the SWDS ($BE_{CH4,y}$) are estimated to be on the average 168,519 tCO_2e per year, over the 2nd 7-year crediting period. The ex-ante estimated project emissions (PE_y) are determined as 128 tCO_2e per year. Emission reductions (ER_y) to be achieved by the project activity were *ex-ante* estimated as the difference of ex-ante estimation of baseline emissions and ex-ante estimation of project emissions. ER_y are thus estimated to be (on the average) 168,391 tCO_2e per year over the 2nd 7-year renewable crediting period.
Detailed calculation of ex-ante estimation of both baseline and project emissions, as provided in the emission reduction calculation spreadsheet /4/ which is enclosed to the updated PDD/ 2/, can be reproduced using data and parameter values provided in the updated PDD /2/ and supporting files submitted to the EPIC validation team.
The selection and determination of all used factors and parameters are deemed reasonable and acceptable (as further assessed in Appendix 7 and 8 of this Validation Report).
In summary, the GHG calculations are complete and transparent.

The EPIC validation team however highlights that forecasted/estimated emission reductions over the 2nd 7-year renewable crediting period are deemed accurate and correct within reasonable limits. Based on assessment of other similar registered CDM project activities (also involving LFG collection and destruction/utilization), the EPIC validation team highlights that methane generation and collection efficiency of LFG in landfills (as typically forecasted through the application of the FOD model in the context of the selected methodology and the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/) has an inherent high uncertainty level (of almost 50% in some cases) and hence the amount of emission reductions, which will be determined on the basis of *ex-post* monitoring, might significantly vary from the forecasted amount.

Summary of ex-ante determination of emission reductions:
As correctly reported in the updated PDD /2/, ex-ante annual estimates of emission reduction to be achieved by the project activity during the 2nd 7-year crediting period are summarized as follows:

Year	Emission reductions (tCO_2e)
2015[5]	25,746
2016	153,581
2017	159,551
2018	164,961
2019	169,959
2020	174,647
2021	179,093
2022[6]	151,200
Total	**1,178,738**
Annual average	168,391

In summary, the EPIC validation team confirmed that calculations for *ex-ante* estimates of emission reductions to be achieved by the project activity during the 2nd 7-year renewable crediting period, as reported in the updated PDD /2/, are deemed complete and transparent.

[5] As correctly outlined in the updated PDD /2/, ex-ante estimates of emission reductions for year 2015 are valid for the period from 29/10/2015 to 31/12/2015.
[6] As correctly outlined in the updated PDD /2/, ex-ante estimates of emission reductions for year 2022 are valid for the period from 01/01/2022 to 22/10/2022.

Appendix 7: Assessment of ex-ante selected (fixed) parameters

As outlined in Section B.6.2 of the updated PDD /2/, the following ex-ante determined (fixed) parameters are correctly defined and used for the ex-ante estimation of emission reduction to be achieved by the project activity within the 2nd 7-year crediting period and/or for the determination of baseline and/or project emissions for the project activity along such crediting period:

Table App 7 -1: Parameters determined *ex-ante*[7]

Parameter / data	Unit	Value applied	Source of used data/ EPIC assessment opinion
Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline (OX_{top_layer})	-	0.1	Default value as per ACM0001 (version 18.0) /5/ is correctly selected and indicated in the updated PDD /2/. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

[7] The table includes all *ex-ante* determined parameters which are presented in Section B.6.2 of the updated PDD. In accordance with applicable CDM guidance for completing the CDM-PDD form, data that are calculated with equations provided in the applied CDM baseline and monitoring methodology and default values specified in the applied methodology and applicable methodological tools are not included in the table and in Section B.6.2 of the PDD. This is deemed correct.

Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity (2007) ($F_{CH4,BL,x-1}$)	tCH_4/yr	484.00	As confirmed by the EPIC validation team, value as per available records of historical measurements performed by Proactiva Meio Ambiente – Brasil (related to year 2007) /28/ is correctly selected. As verified by the EPIC validation team, calculated value represents the outcome of a systematic measurement campaing that was organized and performed by the project participant and project owner Proactiva Meio Ambiente – Brasil within year 2007 (with support of LFG experts contracted for the task). Performed measurements were fully based on campaing encompassing undertaking of systematic measurements of flow and CH_4 content in LFG directly emitted from the 66 pre-project passive LFG venting/combustion drains existent at the Tijuquinhas landfill prior of the implementation of the project activity using appropriate equipment: set of 4 inspection wellheads (specifically developed for installation on LFG extraction system with vertical LFG venting/combustion drains) + portable $CH_4/CO_2/O_2$ gas analyzer units being alternately positioned and jointly applied in the 66 pre-project LFG venting/combustion drains along year 2007. By taking into consideration the design and operational aspects of the Tijuquinhas landfill + results of the set of 12 LFG flow and CH4 content measurements sessions (of 12-hour duration each) encompassed by the campaign in each one of the 66 pre-project passive LFG venting/combustion drains and also by applying representative extrapolations of set of measurement

			sessions for 24 hour per day of the 365-day period encompassed by year 2007, the total amount of methane in the LFG which is captured and destroyed in this particular year (year prior to the implementation of the project activity) was determined as demonstrated in the compiled sheet summarizing related measurements and calculations /38/. It is EPIC opinion that deriving the value for the parameter FCH4,BL,x-1 (value for year 2007) based on the results of previously performed evaluation work encompassing systematic measurement campaign of flow and CH4 content in LFG directly emitted from 66 LFG venting/combustion drains + applying representative extrapolations of set of measurement sessions for 24 hour per day of the 365-day period encompassed by year 2007 represent a deemed reasonable and acceptable determination approach. The EPIC validation team also reviewed technical sheets with the specifications and function of measurement indtruments/equipment applied during the measurement campaign (Accu-Flo model wellheads, wellbore seals and portable $CH_4/O_2/O_2$ gas analyser units manufactured by LANDTEC North America, Inc.) /39/ /40/ /41/ and was able to confirm the suitability of such instruments/equipment for performance of measurements as part of the campaign. As a conclusion, applied measurement procedures and related calculations were confirmed by EPIC to be deemed appropriate and representative. In summary, the parameter and its selected value are reported under consistency with the selected CDM

			baseline and monitoring methodology and/or applicable methodological tool(s).
Global Warming Potential of CH_4 (GWP_{CH4})	tCO_2e/tCH_4	25	As also indicated in the updated PDD /2/, ACM0001 (version 18.0) defines the following for the selection of the value of the parameter GWP_{CH4}: *"Default value of 25 from IPCC Fourth Assessment Report (AR4). Shall be updated according to any future COP/MOP decisions"* In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Efficiency of the LFG capture system that will be installed in the project activity (η_{PJ})	-	0.70	As confirmed by the EPIC validation team, selected value is as per available literature. Information available in the technical paper "Measuring landfill gas collection efficiency using surface methane concentration" /20/ estimates that the typical LFG collection efficiency in LFG collection and destruction initiatives typically range from 60 to 85%. This paper is publicly available at the website of the California Environmental Protection Agency. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Universal ideal gases constant (R_u)	$Pa.m^3/kmol.K$	8,314	Default values as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a
Molecular mass of gas *k* (MM_k)	kg/kmol	28.01 (N_2)	

Molecular mass of greenhouse gas *i* (MM_i)	kg/kmol	16.04 (CH_4)	gaseous stream" (version 03.0) /12/ are correctly applied in the updated PDD /2/. In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Total pressure at normal conditions (P_n)	Pa	101,325	
Temperature at normal conditions (T_n)	K	273.15	
Molecular mass of water (MM_{H2O})	kg/kmol	18.0152	
Average technical transmission and distribution losses for providing electricity to the grid and for grid sourced electricity consumed by the project activity ($TDL_{grid,y}$)	%	20	Applicable conservative default value is correctly selected as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ (default values as established by option A.1). In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Weighting of build margin emissions factor (w_{BM})	%	0.75 (75%)	Values are correctly selected as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 05.0) /13/ (default value applicable for 2nd 7-year crediting period of a CDM project activity). In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Weighting of operating margin emissions factor (w_{OM})	%	0.25 (25%)	

Build margin CO_2 emission factor in year *y* ($EF_{grid,BM,y}$)	tCO_2/MWh	0.1581	Values are correctly selected as per the methodological tool "Tool to calculate the emission factor for an electricity system" (version 05.0) /13/. The selected values valid for all years encompassed by the 2nd 7-year crediting period correctly represents the value calculated by the DNA of Brazil as being valid for year 2016. Applied values for $EF_{grid,BM,y}$ and $EF_{grid,OM-adj,y}$ = $EF_{grid,OM,y}$ (of year 2016 vintage) were confirmed by the EPIC validation team has being the latest annual values available at the time of start of the validation assessment for the renewal of 7-year crediting period of the project activity.
Operating margin CO_2 emission factor in year *y* ($EF_{grid,OM-adj,y}$ = $EF_{grid,OM,y}$)	tCO_2/MWh	0.4979	
			In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Model correction factor to account for model uncertainties ($\varphi_{default}$) (as appropriately outlined in the updated PDD /2/, $\varphi_{default}$ is equivalent to φ_y)	-	0.75	Values are correctly selected according to the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/ (default value for Application A) (based on the climate conditions valid for the location of the project activity and/or technical design aspects of the Tijuquinhas landfill). In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste) (OX)	-	0.1	
Fraction of methane in the SWDS gas (volume fraction) (F)	-	0.5	
Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS. ($DOC_{f,default}$)	Weight fraction	0.5	
Methane correction factor ($MCF_{default}$)	-	1.0	Assessment details are presented below
Fraction of degradable organic carbon (by weight) in the waste type *j* (weight fraction) (DOC_j)	-	Assessment details are presented below this table.	
Decay rate for the waste type j (k_j)	1/yr		
Weight fraction of the waste type (W_j)	-		

Manufacturer's flare specifications for temperature, flow rate / heat flux and maintenance schedule ($SPEC_{flare}$) (valid for both currently installed flares)	Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH_4 destruction efficiency):	°C	500 (min)	1,200 (max)	Values are correctly indicated as per the information assessed in the clarification letter provided by the flare manufacturer Biotecnogás s.r.l. In summary, the parameters and their selected values are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
	Operational LFG flow (for continuous operation)	Nm^3/h	300 (min)	2,000 (max)	
	Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material)	Days	every 6 months (every 180 days)		
	Required/ recommended minimum frequency for replacement of the flare isolation ceramics revetment material	-	After 10 years of regular and appropriate operation		
Rated capacity of the installed captive backup electricity generator (fuelled by diesel) ($PP_{CP,Diesel\text{-}generator}$)	MW	0.113	The selected value correctly represents the nameplate installed capacity for the captive off-grid electricity generator (fuelled by diesel) which is installed as part of the project activity.		Rated capacity of the installed captive backup electricity generator (fuelled by diesel) ($PP_{CP,Diesel\text{-}generator}$) -
Average technical transmission and distribution losses for electricity sourced by the captive electricity generator ($TDL_{captive,y}$)	-	0	Applicable default value is correctly selected as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/ when scenario		Average technical transmission and distribution losses for electricity sourced by the captive electricity generator ($TDL_{captive,y}$)

			B of the tool is selected by the project participant.	
CO_2 emission factor for electricity sourced by the captive off-grid electricity generators ($EF_{EL,captive,y}$)	tCO_2/MWh	1.3	Selected value correctly corresponds to the conservative default value as per applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) /11/.	CO_2 emission factor for electricity sourced by the captive off-grid electricity generators ($EF_{EL,captive,y}$)

Additional assessment details for the ex-ante determined parameter $MCF_{default}$, DOC_j , k_j and w_j:

Assessment of the suitability of ex-ante determined value for parameter $MCF_{default}$:
By taking into account the current and forecasted MSW disposal and management practice at the Tijuquinhas landfill and also by assessing the valid operational license for such landfill /29/), the EPIC validation team was able to confirm that MSW has been disposed in this particular landfill with depths greater than 5 meters and appropriate MSW landfilling measures have been undertaken and are expected continue being performed throughout the whole landfill operational lifetime (such as effective mechanical compacting, leveling and covering of disposed MSW). The EPIC validation team was thus able to conclude that the selected value for the *ex-ante* determined parameter $MCF_{default}$ (equal to 1.0) is deemed acceptable, reasonable and in accordance with applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/. In summary, the parameter and its selected value are reported under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s). In summary, the parameter and its selected values are reported under consistency with the project site conditions, selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Assessment of the suitability of ex-ante determined values for parameters DOC_j , k_j and w_j:
As established by the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/, default IPCC 2006 values /9/ were correctly selected for the parameters Fraction of degradable organic carbon in the waste type *j* (weight fraction) (DOC_j), Decay rate for the waste type *j* (k_j) and Weight fraction of the waste type (W_j) by taking into account the available statistics and meteorological data valid for the region where the Tijuquinhas landfill is located. The selected values for DOC_j, k_j and w_j for the different fractions of solid waste types are presented in the table below. Furthermore, the values were confirmed by the EPIC validation team to be deemed appropriate and correct. Values of mean temperatures and precipitation data for the city of Biguaçu were also correctly taken into account for the determination of values of k_j as required by the methodological tool "Emissions from solid waste disposal sites" (version 08.0) /14/.

Table App 7 -2: Composition of disposed MSW (w_j) and *ex-ante* selected values for the parameter DOC_j and k_j

Waste type *j*	Fraction of degradable organic carbon (by weight) in the waste type *j* (DOC_j)	Decay rate for the waste type *j* (k_j) (in 1/yr)	Weight fraction of the waste type *j* (w_j)
Wood and wood products	43%	0.035	4.7%
Pulp, paper and cardboard (other than sludge)	40%	0.07	17.1%
Food, food waste, beverages and tobacco (other than sludge)	15%	0.4	44.9%
Textiles	24%	0.07	2.6%
Garden, yard and park waste	20%	0.17	0.0%
Glass, plastic, metal, other inert waste	0%	0	30.7%

In summary, the parameters and their selected values are reported under consistency with the project site conditions, selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Conclusion about the assessment of the selection of ex-ante determined (fixed) parameters as per the updated version of the PDD:

In summary, the selection and report of the all *ex-ante* determined (fixed) parameters in the updated the PDD (version 7.0 dated 07/05/2018) /2/ is deemed reasonable, complete and transparent.

The rationale/justification for selected values for all *ex-ante* determined (fixed) parameters is sufficiently provided in the updated PDD /2/. Supporting evidences for the selected values were made available to the EPIC validation team. Referred data sources were also verified by the EPIC validation team. In summary, the description of all ex-ante selected (fixed) parameters and their selected values are reported under consistency with the project site conditions, selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Appendix 8: Assessment of parameters monitored ex-post

The parameters to be monitored ex-post are correctly indicated in the updated PDD (version 7.0, dated 07/05/2018) /2/ as required by ACM0001 (version 18.0) /5/ + the following applicable methodological tools:

- Emissions from solid waste disposal sites (version 08.0) /14/
- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0) /11/
- Project emissions from flaring (version 02.0.0) /10/
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0) /12/
- Tool to calculate the emission factor for an electricity system (version 05.0) /13/
- Combined tool to identify the baseline scenario and demonstrate additionality (version 06.0) /30/
- Assessment of validity of the original/current baseline and to update the baseline at the renewal of a crediting period (version 03.0.1) /32/

The updated PDD /2/ correctly includes in Sections B.7.1 and B.7.3 details about all parameters to be monitored *ex-post* along the 2nd 7-year renewable crediting period for which related assessment is included in the table below:

Table App 8 -1: Parameters to be monitored *ex-post*

Parameter	Assessment details
Management of SWDS	The design and operational conditions of the Tijuquinhas landfill will be annually monitored on the basis of different sources such as: - Original design of the landfill vis-a-vis eventual changes; - Technical specifications for the management of the Tijuquinhas landfill vis-a-vis eventual related eventual changes; - Applicable local or national regulations As required by ACM0001 (version 18.0) /5/, the design and operational conditions of the Tijuquinhas landfill should be demonstrated not to be modified in order to ensure that no practice to increase methane generation have occurred prior or after the implementation of the project activity. As established by ACM0001 (version 18.0) /5/, any change in the management of the landfill after the implementation of the project activity will be justified by referring to technical or regulatory specifications. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric flow of LFG stream in time interval *t* on a wet basis ($V_{t,wb}$)	Continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instruments will be performed with frequency established as per manufacturer specifications/requirements. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Volumetric flow of LFG stream in time interval *t* on a dry basis ($V_{t,db}$)	Continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instruments will be performed with frequency established as per manufacturer specifications/requirements. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis ($v_{CH4,t,db}$)	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Volumetric fraction of CH_4 in time interval *t* on a wet basis ($v_{CH4,t,wb}$)	Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Mass flow of the LFG stream in time interval *t* on dry basis ($M_{t,db}$)	Continuous measurements will be recorded/reported at least with an every-minute frequency. Calibration events in related monitoring instruments will be performed with frequency established as per manufacturer specifications/requirements. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Temperature of the LFG stream in time interval *t* (T_t)	Measurements for T_t will be recorded and reported in ^{o}C. Recorded/ reported data will be converted to Kelvin (in order to also being recorded/ reported in K). Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Pressure of the LFG stream in time interval *t* (P_t)	Depending on installed measurement instrument, measurements for P_t will be recorded and reported in mbar. Recorded/reported data will be converted into Pascal (in order to be also recorded and reported in Pa). Continuous measurements will be recorded/reported with an every-minute frequency. Calibration frequency as per manufacturer specifications. In case of measurements for the applicable LFG flow parameter are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of T_t and P_t may not be required. If the applicability condition related to the gaseous stream flow temperature being below 60ºC is adopted, these parameters shall be monitored continuously in order to assure that the applicability condition is indeed met). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Amount of grid electricity consumed by the project activity during the year *y* ($EC_{PJ,grid,y}$)	Continuous measurements will be aggregated manually or automatically. Accumulated measurement records will be recorded and reported at least with an every-month frequency. Measurement records will be cross-checked against available electricity consumption receipts/invoices issued by the local electricity distribution company. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t* ($F_{CH4,EG,t}$)	Measured in accordance to an appropriate national or international standard e.g. UKs Technical Guidance LFTGN05. The time period *t* over which the mass flow is measured must be at least one hour. The average flow rate to the flare during the time period *t* must be greater than the average flow rate observed for the previous six months. Monitoring of this parameter is required in the case of enclosed flares and if the project participant select Option B.1 to determine flare efficiency. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Saturation pressure of H_2O at temperature T_t in time interval *t* ($p_{H2O,t,Sat}$)	As appropriately outlined in the updated PDD /2/ and under conformance with applicable guidance of the methodological tool "Tool to determine the mass flow of greenhouse gas in a gaseous stream" (version 03.0) /12/, data will be selected as per the literature "*Fundamentals of Classical Thermodynamics*"; (Authors: Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4º Edition 1994. Published by John Wiley & Sons, Inc.). As confirmed by the EPIC validation team, this literature represents normative reference for the the methodological tool "Tool to determine the mass flow of greenhouse gas in a gaseous stream" (version 03.0) /12/. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

Temperature in the exhaust gas of the enclosed flare in minute *m* ($T_{EG,m}$)	For each installed flare, measured by appropriate temperature measurement equipment with an every-minute frequency. Measurements outside the operational temperature specified by the manufacturer may indicate that the flare is not functioning correctly and may require maintenance. Flare manufacturers must provide suitable monitoring ports for the monitoring of the temperature of the flare. These would normally be expected to be in the middle third of the flare. Where more than one temperature port is fitted to the flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer specifications for temperature. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Flame detection of flare in the minute *m* ($Flame_m$)	For each installed flare, detection of flame in the flare recorded with an every-minute frequency as a minute that the flame was on, otherwise recorded as a minute that the flame was off. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Maintenance events completed in year *y* as monitored by the project participants ($Maintenance_y$)	Record the date that maintenance events were completed in year *y*. Records of maintenance logs must include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers and calibration certificates. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Operational status of biogas destruction devices (Status of biogas destruction device)	Continuous measurements. As there is no electricity generation in this project activity, is applicable to consider the same procedure as adopted for parameter $Flame_m$. Monitoring and documenting may be undertaken through monitoring of by recording the energy production from methane captured or the operation of the flare (by means of a flame detector) in order to demonstrate the actual destruction of methane in such uniquely installed biogas destruction device, unless a different method is specified in the underlying methodology/tool. Emission reductions will not accrue for periods in which the underlying destruction device (high temperature enclosed flare) is not operational. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Quantity of electricity generated in captive diesel backup generator during the year *y* ($EC_{PJ,captive,y}$)	Measurements performed by electricity meter(s) will be aggregated manually or automatically. Accumulated measurement records will be reported with at least every-month frequency. Measurement records will be crosschecked against available diesel consumption receipts/invoices issued by the diesel supplying company. $EC_{PJ,captive,y}$ will be monitored in case Alternative approach 1 or alternative

	approach 2 is used for the determination of Project emissions due to the consumption of electricity sourced by backup captive off-grid electricity generator (fuelled by Diesel) ($PE_{EC,captive,y}$). In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Quantity of fuel diesel combusted by the captive off-grid electricity generator ($FC_{Diesel,y}$)	Monitoring will be made weekly, recording the operating hours and the percentage of fuel load of equipment, considering the specific fuel consumption specified by the equipment manufacturer. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
Net calorific value of the fuel diesel in year y ($NCV_{Diesel,y}$)	Value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. Any future revision of the IPCC Guidelines will be taken into account. If the diesel supplier does provide related NCV values and CO_2 emission factor for the delivered fuel on the invoice and these two values are based on measurements for this specific fuel, this source will be used for the determination of values for the monitoring parameter $NCV_{Diesel,y.}$. In case, another source(s) for the values is/are applied, regional or national default values or IPCC default values will thus be considered. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).
CO_2 emission factor of fuel Diesel in year *y* ($EF_{CO2,Diesel,y}$)	Value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories). Appropriate net calorific value (NCV) for diesel may be used for converting energy basis data into mass basis data. In case values are provided by the fuel supplier in invoices, the applied weighted average annual value will be determined based on provided related information in the context of each individual fuel delivery event. In case regional or national default values or IPCC default values are considered an every year monitoring frequency is applied. In summary, both the parameter description and its monitoring approach are selected/defined and reported in the updated PDD /2/ under consistency with the selected CDM baseline and monitoring methodology and/or applicable methodological tool(s).

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Document information

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02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
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